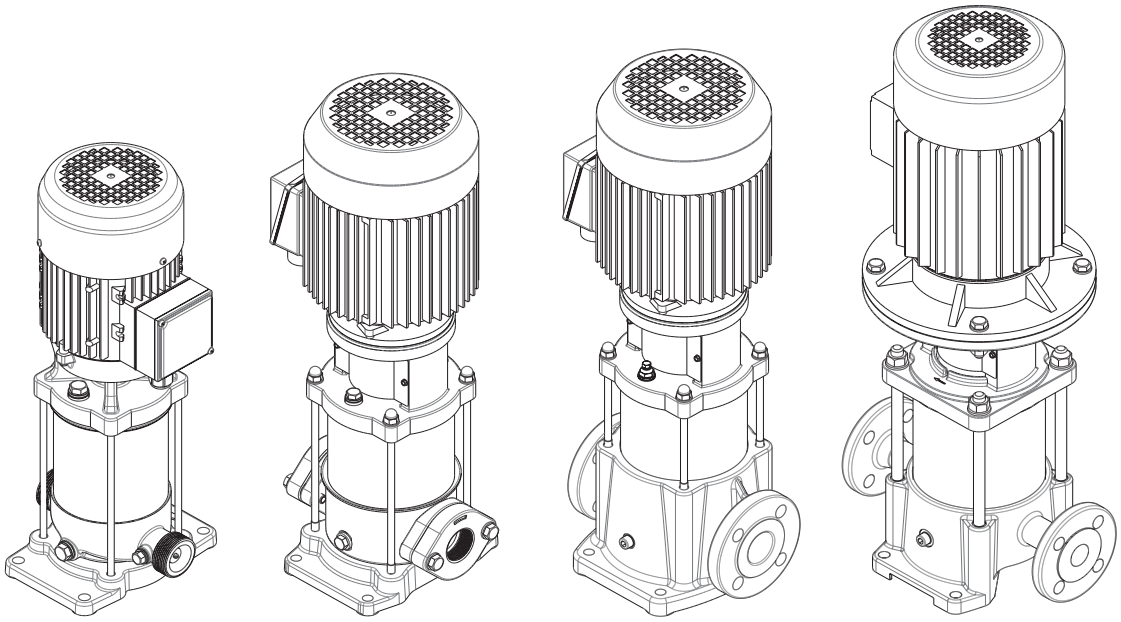
Vertical multi-stage centrifugal pumps

Installation and operating instructions
series: DPVE/DPV(S)/DPVCF/DPLHS



DPVE DPV(S) DPVCF DPLHS

Table of Contents

1 Manual Introduction
1.1 Preface 4
1.2 Icons and symbols 4

2 Identification, service and technical support
2.1 Obtaining data and information 5
2.2 Nominal current 6
2.3 Supplementary documentation 6

3 Warranty
3.1 Terms of warranty 7

4 Safety and environment
4.1 General 8
4.2 Users 8
4.3 Safety provisions 8
4.4 Safety precautions 9
4.5 Environmental aspects 9

5 Pump Introduction
5.1 General 10
5.2 Intended use 10
5.3 Working range 11
5.4 Explosion safety 12
5.5 Operation 13

6 Transport
6.1 Transport 14
6.2 Weight 15
6.3 Storage 15

7 Installation instructions
7.1 Setting up the pump 16
7.2 Mounting a motor on the pump 17
7.3 Electrical install 20
7.4 Commissioning 20

8 Operation
8.1 Operation 22

9 Maintenance
9.1 Introduction 23
9.2 Lubrication 23
9.3 Maintaining the pump for an extended period of non-operation 23
9.4 Replace DPVE non-return valve 23

10 Failures

10.1 Failure table 24

11 Annexes

11.1 Spare part kits 27
11.2 Technical specifications 42
11.3 Torques of coupling bolts - pos 914.01 44
11.4 CE declaration of conformity 45

1 Manual Introduction

1.1 Preface

This manual contains important information for reliable proper and efficient operation. Compliance with the operating instructions is of vital importance to ensure reliability and a long service life of the product and to avoid any risks.
The first chapters contain information about this manual and safety in general. The following chapters provide information about normal use, installation, maintenance and repairs of the product. The annexes contain the technical data, the parts drawings and the declaration(s) of conformity.

- Make yourself familiar with the content.
- Accurately follow the directions and instructions.
- Never change the sequence of the operations to be carried out.
- Keep this manual or a copy of it together with the logbook in a fixed place near the product which can be accessed by all personnel.

1.2 Icons and symbols

In this manual and in all accompanying documentation the following icons and symbols are used.

WARNING
Danger of electric Voltage. Safety sign according to IEC 417 - 5036

WARNING
Operations or procedures, if carried out without caution, may cause personal injury or damage to the product. General hazard sign according to ISO 7000-0434

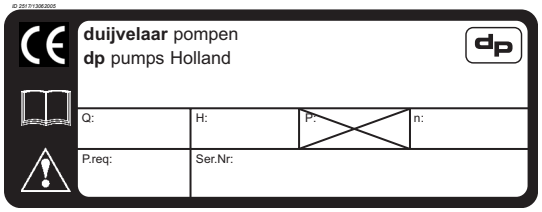
ATTENTION
Is used to introduce safety instructions whose non-observance may lead to damage to the product and its functions.

ENVIRONMENTAL INSTRUCTION
Remarks with respect to the environment.

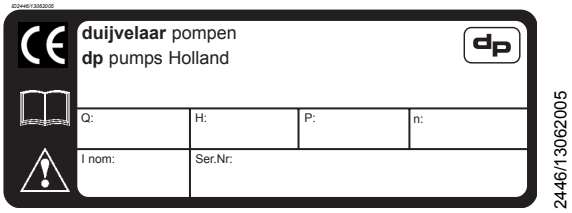
2 Identification, service and technical support

2.1 Obtaining data and information

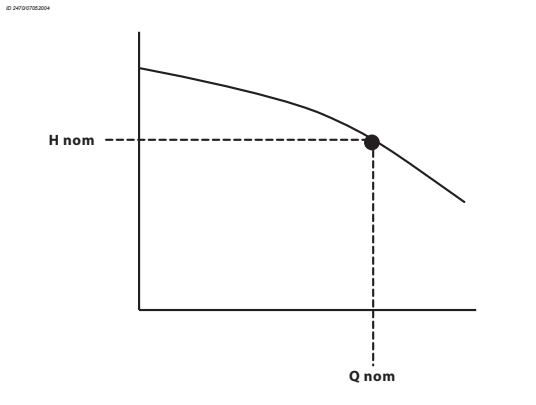
The name plate indicates the type series / size, main operating data and identification number. Please quote this information (first two lines*) in all queries, repeat orders and particularly when ordering spare parts. If you need any additional information or instructions exceeding the scope of this manual or in case of damage please contact DP-Pumps's nearest customer service centre.



Pump without motor



Pump with motor



Indication		Meaning
DPV	4-40	Pump type*
S: / ser.nr.		Serial number*
19/2004/234567	19	Production week*
	2004	Production year*
	234567	Product identification (as built file)*
Ca / Sic / EPDM	Ca	Rotating part mechanical seal (Carbon)*
	Sic	Stationary part mechanical seal (Siliconcarbide)*
	EPDM	Static sealing, O-rings (EPDM)*
PN	10	Pressure class (flange) connection*
Q	m^3/h - l/sec. - USGPM	Nominal capacity (see Q/H curve above)
H	mWc - PSI	Nominal head (see Q/H curve above)
I_{nom}[1]	A	Nominal current (see 2.2)
n	^{1}/min	Nominal rotation speed
P	kW - HP	Installed motor power on the pump
P_{req}	kW - HP	Required motor power for the pump

1. For pumps delivered with special motors no values are given (please use values as indicated on the motor plate).

The following address data are available for service and technical support:

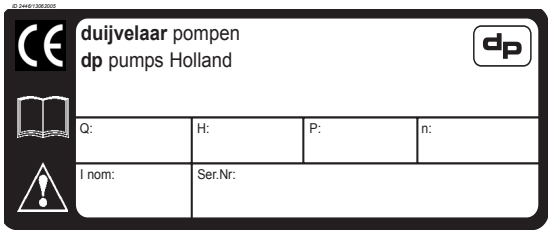
DP-Pumps **service department** Kalkovenweg 13 2401 LJ Alphen a/d Rijn The Netherlands	Tel: +31 172 488325 Fax: +31 172 468930 Internet: www.dp-pumps.com E-mail: dp@dp-pumps.com

2.2 Nominal current

The maximum allowable current of the motor is mentioned as I.max. on the motor plate. This maximum allowable current shows the maximum working range of the motor and can be used to protect the motor.

WARNING
Be careful in using it this way, because, not only the motor, but also the pump has to be protected in its application.

On the pump plate (sleeve sticker) this "pump current at 400 Volts" will be mentioned as I nom. and can be used to pre-set the motor protection switch to protect the pump/motor combination.



This current value can also be used to determine the proper electrical equipment such as variable frequency drive, main switch, wiring diameter etc.

2.3 Supplementary documentation

Apart from this manual, the documentation given below is also available:

Document	Date/version	Code
General terms of delivery	10-1998	119 / 1998
Engineering Reference Book	11-2008	BE00000329
Technical Data 50Hz	07-2008	97004434
Technical Data 60Hz	07-2008	97004435
Technical Data 60Hz U.S.	12-2007	97004436
Motec operating instructions	09-2001	BA-8200-motec-frequency-inverters-V3-0.EM
See also www.dp-pumps.com		

3 Warranty

3.1 Terms of warranty

The warranty period is settled by terms of your contract or at least by the general terms and conditions of sales.

ATTENTION
Modifications or alterations of the product supplied are only permitted after consultation with the manufacturer. Original spare parts and accessories authorized by the manufacturer ensure safety. The use of other parts can invalidate any liability of the manufacturer for consequential damage.

ATTENTION
The warranty relating to the operating reliability and safety of the product supplied is only valid if the product is used in accordance with its designated use as described in the following sections of this manual. The limits stated in the data sheet must not be exceeded under any circumstances.

The warranty becomes invalid if one or more of the points below occur.

- The buyer makes modifications himself.
- The buyer carries out repairs himself or has these carried out by a third party.
- The product has been handled or maintained improperly.
- The product has non original DP-Pumps spare parts fitted.

DP-Pumps remedies defects under warranty if the points below are observed.

- Defects are caused by flaws in the design, the materials or the production.
- The defect has been reported within the warranty period.

Other terms of warranty have been included in the general terms of delivery, which are available upon request.

4 Safety and environment

4.1 General

This DP-Pumps product has been developed using state-of-the-art technology; it is manufactured with utmost care and subject to continuous quality control. DP-Pumps does not accept any liability for damage and injury caused by not observing the directions and instructions in this manual. This also applies in cases of carelessness during the installation procedure, use and maintenance of the product.
Non-compliance with safety instructions can jeopardize the safety of personnel, the environment and the product itself. Non-compliance with these safety instructions will also lead to forfeiture of any and all rights to claims for damages.
For example, in particular non-compliance can result in:

- failure of important pump/system functions,
- failure of prescribed maintenance and servicing practices,
- injury to persons by electrical, mechanical and chemical effects,
- hazard of the environment due to leakage of hazardous substances,
- explosions.

Depending on specific activities, extra safety measures may be required. Contact DP-Pumps if a potential danger arises during use.

ATTENTION
The owner of the product is responsible for compliance with the local safety regulations and internal company guidelines.

ATTENTION
Not only must the general safety instructions laid down in this chapter on "Safety" be complied with, but also the safety instructions outlined under specific headings

4.2 Users

All personnel involved in the operation, maintenance, inspection and installation of the product must be fully qualified to carry out the work involved.
Personal responsibilities, competence and supervision must be clearly defined by the operator. If the personnel in question is not already in possession of the required know-how, appropriate training and instruction must be provided. If required, the operator may commission the manufacturer / supplier to take care of such training. In addition, the operator is responsible for ensuring that the contents of the operating instructions are fully understood by the responsible personnel.

4.3 Safety provisions

The product has been designed with the greatest possible care. Original parts and accessories meet the safety regulations. Modifications in the construction or the use of non-original parts may lead to a safety risk.

ATTENTION
Make sure that the product operates within its working range. Only then the product performance is guaranteed.

4.3.1 Labels on the product

The icons, warnings and instructions applied to the product are part of the safety provisions. The labels may not be removed or covered. Labels must remain legible during the entire life of the product. Replace damaged labels immediately.

4.4 Safety precautions

4.4.1 During normal use

- Contact the local electricity company for questions about the power supply.
- Shield parts, that can become hot in such a way, that direct contact is impossible.
- When applicable, always place undeformed coupling protection plates to protect the coupling, before putting the pump into use. Make sure that the coupling protection plates are never in contact with the running coupling.
- Always close the terminal box on the pump.

4.4.2 During installation, maintenance and repair

Only authorised personnel may install, maintain and inspect the product and repair electrical components. Observe the local safety regulations.

WARNING
Always disconnect the energy supply to the product first, before installation, maintenance and repairs. Secure this disconnection.

WARNING
Surfaces of a pump can be hot, after continuous operation.

WARNING
Make sure that no one can be near rotating components when starting a pump.

WARNING
Handle a pump with dangerous liquids with the utmost care. Avoid danger for persons or the environment when repairing leakages, draining liquids and venting. It is strongly recommended to place a relief barge under the pump.

WARNING
Immediately following completion of the work, all safety-relevant and protective devices must be re-installed and / or re-activated.

WARNING
Please observe all instructions set out in the chapter "Commissioning/Start-up" before returning the product to service.

4.5 Environmental aspects

4.5.1 General

The products of DP-Pumps are designed to function in an environmentally friendly way during their entire life. Therefore, when applicable, always use biodegradable lubricants for maintenance.

ENVIRONMENTAL INSTRUCTION
Always act according to the laws, by-laws regulations and instructions with respect to health, safety and the environment.

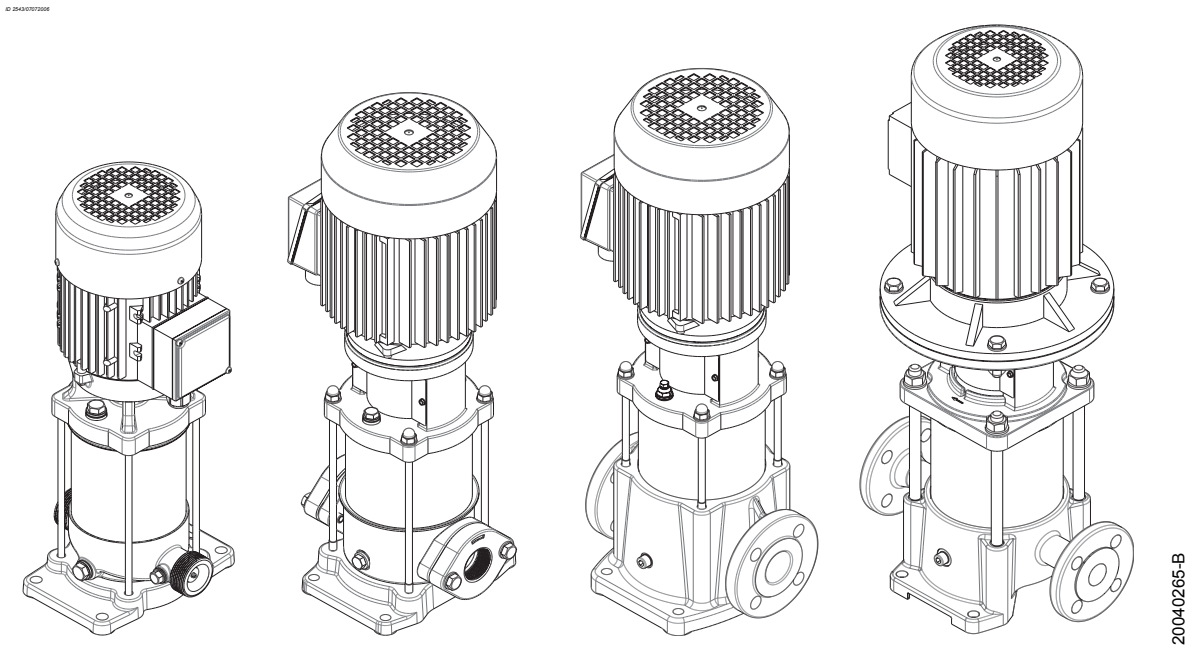
4.5.2 Dismantling

Dismantle the product and dispose of it in an environmentally friendly way. The owner is responsible for this.

ENVIRONMENTAL INSTRUCTION
Ask at the local government about the re-use or the environmentally friendly processing of discarded materials.

5 Pump Introduction

5.1 General



Vertical pumps:

DPVE DPV(S) DPVCF DPLHS

The vertical, multi-stage centrifugal pumps DPVE, DPV(S), DPVCF and DPLHS are produced by DP-Pumps.

5.2 Intended use

The pumps DPVE, DPV(S), DPVCF and DPLHS are suitable to transport and increase the pressure of cold and hot water without wear to parts within the indicated working range. The transport of liquids with a different viscosity or density than water is possible as well. For this a motor with an adjusted power is used. Ask DP-Pumps or your distributor for advice.

Any other or further use of the pump is not in conformity with its intended use. DP-Pumps does not accept any liability for any damage or injury that results from this. The pump is produced in accordance with the current standards and guidelines. Use the pump only in a perfect technical state, in conformance with the intended use described below.

The *Intended use* as laid down in EN 12100-1 is the use for which the technical product is intended according to the specifications of the manufacturer. The use of the product has been described in the sales brochure and in the user manual. Always observe the instructions given in the user manual. When in doubt the product must be used as becomes evident from its construction, version and function.

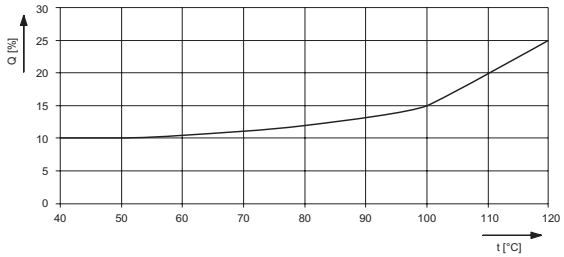
5.3 Working range

The working range of the pumps in this series can be summarised as follows:

Table 1: Specification of the working range

Pump type	DPVE	DPV	DPVF/V	DPVS	DPVSF/V	DPVCF	DPLHS
Ambient temperature [°C]	+4 to 40						
Liquid temperature [°C]	-15 to 60	-15 to 100[1]		-15 to 120[2]		-15 to 120	-15 to 80[3]
Maximum working pressure [bar]	10[4]	16[4]	25[4]	16[4]	25[4]	25[4]	40[4]
Allowable size of solids pumped	5µ to 1mm						
Minimum supply pressure	Not cavitating[5].						
Viscosity liquid [cSt]	1						
	A higher viscosity may require more motor power.[5]						
Density liquid [kg/m^3]	1000						
	A higher density may require more motor power.[5]						
Cooling	The space above the cooling fan of the motor must at least be equal to 1/4 of the diameter of the inlet of the cooling fan of the motor in order to have a sufficient supply of air.						
Number of starts	Related to the motor[6]						
Minimum frequency [Hz]	10						
Maximum frequency [Hz]	60[7]						

1. Using the factory option “o-ring sealing EPDM E425” the max. temp. limit is 120°C.
2. When pumping water, the max. allowable liquid temp is 80°C.
3. Higher temperatures are possible at lower pressure. For specific limits consult your supplier.
4. The total of the supply pressure and no-load delivery pressure with closed outlet shut-off valve may not exceed the maximum working pressure.
5. Contact your supplier for more detailed advice.
6. For standard motors see the technical specifications. When the pump is fitted with another motor brand, please consult the motor supplier.
7. Pumps that are intended for 50 Hz operation, may not be connected to 60 Hz.



Minimum volume flows (Q) in % of Q optimum temperatures (t).

Table 2: Minimum volume flows (Q_{min})

DP	50 Hz	60 Hz
	Q_{min} in m^3/h	
2	0.3	0.3
4	0.6	0.65
6	0.8	0.8
10	1.2	1.4
14	1.0	1.1
18	2.4	2.4
24	2.2	2.6
32	4.0	4.0
45	4.6	5.1
65	6.1	6.1

Table 3: Specific applications

type	application area
DPV	(Drinking) water supply systems, irrigation systems, water treatment systems, car-wash systems, sprinkler systems.
DPVS	Water-supply systems for drinking water, softened and demineralised water, systems for brackish water, sea water and swimming-pool water, however limited with respect to temperature, pressure and chlorine percentage.
DPVCF	Systems for boiler supply and discharge of condensed water
DPLHS	Reverse osmosis installations and high pressure cleaning systems.
DPVE	(Drinking) water supply systems.

5.4 Explosion safety

ATTENTION
This sub chapter contains fundamental information which has to be taken in consideration when installing the pump with ATEX permission in a hazardous environment.

5.4.1 General

Stickers or indicators on the pump sleeve and the motor indicates whether the pump is suitable for use in an environment with risk of explosion.
It is allowed to install the pump in a zone which is classified in directive 1999/92/EC.
When in doubt it is compulsory to check the above directive.

5.4.2 Indication

Table 4: Explosion safety

Indication	Meaning
II	Product group for use above ground, with the exception of mine working where there can be danger of explosion due to mine gas and/or flammable substances.
2/3	Category 2: Equipment in this category is intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours or mists or by air/dusts mixtures are likely to occur. Category 3: Equipment in this category is intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours or mists or by air/dusts mixtures are likely to occur or, if they do occur, are likely to do so only infrequently and for a short period only.
G	Suitable for an environment that is explosive due to gas, vapour or fumes; not suitable for an environment that is explosive due to dust.
EEx c	Protection principle type c: for products that are constructively safe.
T4/T3	Temperature class: T4 for medium temperatures up to 100°C; T3 for medium temperatures above 100°C

ATTENTION
When there is an ATEX sticker on the pump, the pump must only be used for pumping a medium with a conductivity higher than 50 pS/m. The medium must not be flammable.

ATTENTION
When the pump is placed in an explosion hazardous environment no pump should be opened or disassembled on site. Due to the probable creation of sparks during loosening and tightening of nuts and bolts.

5.4.3 Commissioning (check list)

It is compulsory to check these points prior to put the pump in operation.

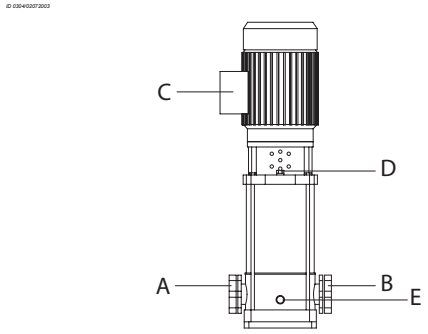
- Check if the ATEX-data on the motor and the pump are in line with the specified category. See table 5ATEX-Categories13.
- When the categories of the motor and the pump are different, the lowest category is leading.
- For category 2: make sure that the pump is protected against damage from outside.
- Check that the motor cable is suitable for the current drawn by the motor. See: motor type plate.
- Check that the pump is fully filled with the liquid (de-aerated). Do not run the pump dry.
- Check the rotational direction of the motor. The motor has to run clockwise (seen from the non driven side). This direction is indicated with an arrow on the pump top bracket.
- Make sure that the liquid temperature never exceeds the temperature mentioned in the explosion safety code T3 or T4. See table 4 Explosion safety12.
- Avoid overheating of the pump to ensure a minimum flow in the pump according with the description in chapter 5.3Working range11.
- The pumps has to be de-aerated again when:
  - the pump is taken out of operation.
  - some air is gathered in the pump.
- Make sure that the pump and the motor shaft are running smoothly and without excessive noise (e.g. no parts are running against each other).
- Make sure that the pump is connected to ground.

Table 5: ATEX-Categories

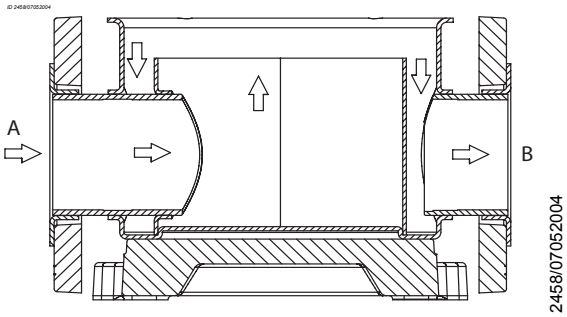
Group	Category		Zone	Pumps	Motors
I	M	1		none	none
		2		none	none
II	1	G	0	none	none
		D	20	none	none
	2	G	1	DPV(S) DPVCF DPLHS	2G Eex e T3 2G Eex d T4
		D	21	none	none
	3	G	2	DPV(S) DPVCF DPLHS	2G Eex e T3 2G Eex d T4
		D	22	none	none

5.5 Operation

The liquid is sucked in through the pump inlet (A) on the supply side under minimum pressure. The pump increases the pressure. The liquid leaves the pump through the pump outlet (B) on the delivery side under increased pressure.



A Pump inlet
B Pump outlet
C Terminal box
D Fill plug/air relief plug
E Drain plug



6 Transport

6.1 Transport

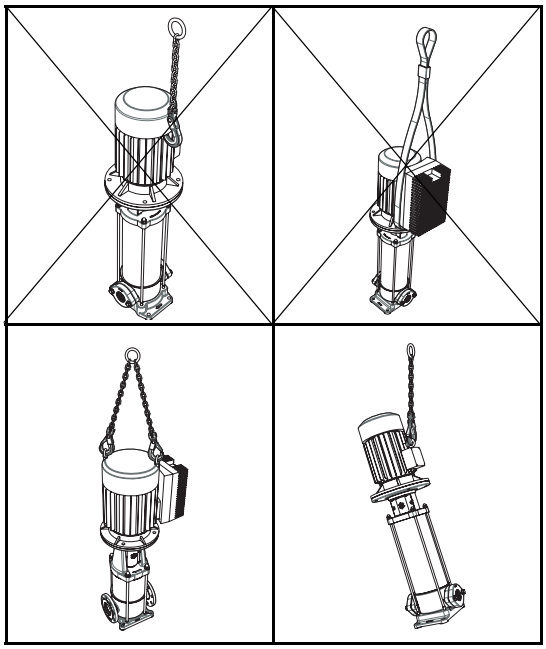
1. Transport the pump in the position as indicated on the pallet or packaging.
2. Make sure the pump is stable.
3. If present, observe the instructions on the packaging.

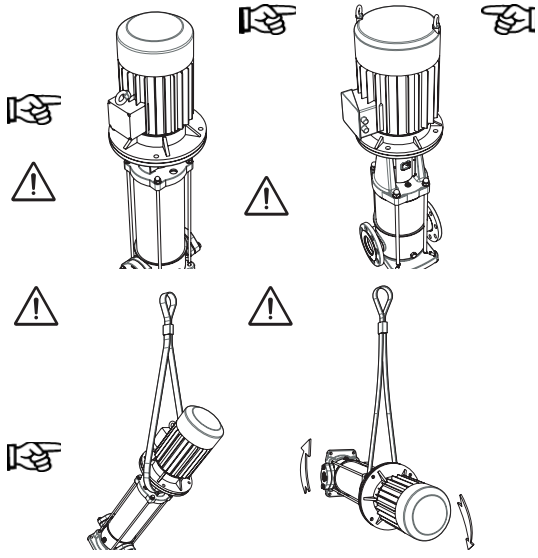
WARNING
Lift the pump, if necessary using a hoist and suitable slings. Attach the slings to the transport lugs on the packaging, where present.

WARNING
The pump must be lifted according to the current hoist guidelines. Only qualified personnel are allowed to lift the pump.

WARNING
Do not lift the pump by using the frequency converter (if placed), electrical parts or the motor cover. Be sure that the pump is always in balance.

WARNING
All the pumps will turn approximately 2 to 15 degrees. Do not remove the lever or protection from the pump before the pump is placed and mounted correctly.





6.2 Weight

Motor	Minimum weight	Maxi-mum weight	Minimum weight with frequency converter	Maximum weight with frequency converter
kW	(kg)	(kg)	(kg)	(kg)
0.37	11	14	18	21
0.55	13	23	20	30
0.75	16	24	23	31
1.1	19	61	26	68
1.5	25	63	32	70
2.2	29	72	38	81
3	43	82	52	91
4	49	86	59	96
5.5	81	120	71.5	130.5
7.5	68	138	78.5	148.5

6.3 Storage

Fill the pump with glycol in order to protect it against the risk of frost.

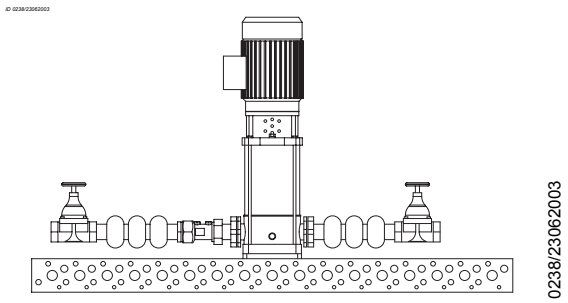
Storage	
$t_{ambient}$ [°C]	-10/40
Max. rel. humidity [%]	80% at 20°C not condensing

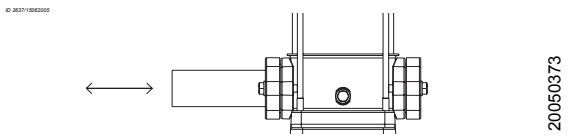
6.3.1 Inspection during storage

1. Turn the shaft every three months and just before putting into operation.

7 Installation instructions

7.1 Setting up the pump





ATTENTION
Make sure that the pump connections are stress-less installed (e.g. no heavy load on the inlet and outlet connections). It is to be advised to use pipe-compensators, see drawing above. Only on the condition that the pump is provided with a reinforced cast casing, model DPVCF, the top/down force on the flanges can be in accordance with the table below.

Table 6: Allowable forces DPVCF

Type	DN [mm]	Force [kN]			
		Fx	Fy	Fz	Σ F
DPVCF 2	25	36	6.8	10.4	38.1
DPVCF 4	32	38	7.2	11	40.2
DPVCF 10	40	45	18	20	52.4
DPVCF 18	50	70	25	23	77.8
DPVCF 32	65	54	25	44	74
DPVCF 45	80	48	17	31	59.6
DPVCF 65	100	60	21	33	71.6

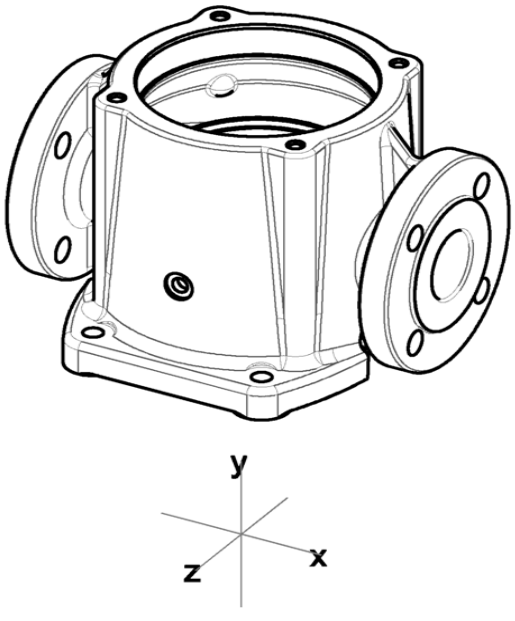
20070301

Table 7: Allowable moment DPVCF

Type	DN [mm]	Moment [Nm]			
		Mx	My	Mz	Σ M
DPVCF 2	25	700	800	1200	1600
DPVCF 4	32	700	800	1200	1600
DPVCF 10	40	1100	1000	2600	3000
DPVCF 18	50	2200	1300	2600	3600
DPVCF 32	65	2300	1700	2000	3500
DPVCF 45	80	2700	2700	2300	4500
DPVCF 65	100	3300	3600	3000	5700

20070301

ATTENTION
The values mentioned in the tables above are given for the point at which a maximal tension of between 200 and 205 MPa occurs. It is assumed that the 3 forces or the 3 moments as given in the drawing below occur simultaneously.

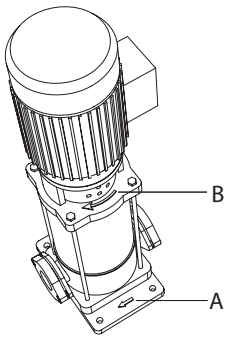


ATTENTION
Pumps that do not stand steady or stable of their own, should be mounted on a ridged and stable base.

ATTENTION
Place the pump there where there is the lowest risk for noise nuisance.

1. Place and install the pump on a level, stable surface in a dry and frost-proof room.
2. Make sure that sufficient air can reach the cooling fan of the motor. For this purpose the free space above the cooling fan should be at least 1/4 of the diameter of the fan cover air intake.
3. Install the pump with counter flanges. Pumps with non-standardised connections; counter flanges are delivered separately.
4. Install a valve on the supply and on the delivery connection of the pump.
5. If there is a chance that when the pump is standing still the medium can flow back, it is advised to install a non-return valve.
6. Make sure that the inlet of the pump is never clogged.

7.1.1 Indicators



0237/24062003

The arrow (A) on the pump foot indicates the flow direction of the liquid. The arrow (B) on the top bracket indicates the rotating direction of the motor.

7.1.2 Install bypass

Install a bypass if the pump operates against a closed valve. The required capacity of the bypass is at least 10% of the optimum volume flow. At high operating temperatures a higher volume flow is required. Refer to the table "Minimum volume flows" in the paragraph "Working range".

7.2 Mounting a motor on the pump

ATTENTION
It is to be advised to use a special designed DP-Pumps motor. Before installing an other brand/standard IEC-norm motor, DP-Pumps has to be consulted to judge the applicability.

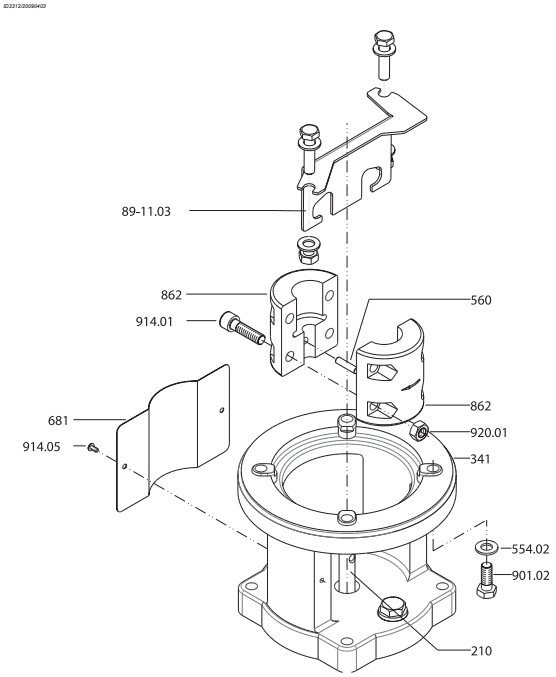
The motor has to conform to the following conditions:

- Increased power output (to limit the standard installed motor power)
- Reinforced bearing at driven end (to withstand the axial force)
- Fixed bearing at driven end (to minimize the axial play)
- Smooth shaft, no key lock (to improve the coupling grip and to improve the motor balance)

The advised bearings per motor type are:

[kW]	Axial bearing	[kW]	Co-axial bearing
0.37	6203-2RS-C3	11	7309-BEP
0.55	6203-2RS-C3	15	7309-BEP
0.75	6204-2RS-C3	18.5	7309-BEP
1.1	6204-2RS-C3	22	7311-BEP
1.5	6305-2Z-C3	30	7312-BEP
2.2	6305-2Z-C3	37	7312-BEP
3	6306-2Z-C3		
4	6306-2Z-C3		
5.5	6308-2Z-C3		
7.5	6308-2Z-C3		

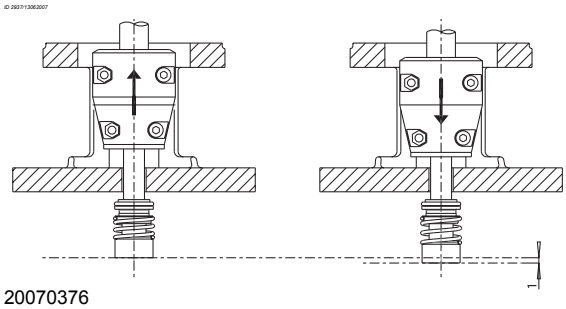
7.2.1 Install the motor on pumps, supplied without motor, with a standard mechanical seal.



20090321/20090402

1. Remove the couplingguards (681) and the coupling shells (862).
2. Remove the sealprotection bracket (89-11.03) and its mounting material. For pumps with a taper piece (722) (with motor of 5.5 kW or higher), the two bolts (914.02 or 901.02) has to be placed back to connect the taper piece to the motor stool. Thoroughly clean the motor stool (341), the shaft (210), the coupling shells (862) and the motor shaft.
3. Loosely fasten the coupling shells (862) with the coupling pin (560) on the shaft (210). Use the hexagon socket head cap screw (914.01) and the nut (920.01) for this. (When the pump is equipped with a steel coupling, never use the same coupling twice but order a new one).
4. Place the motor on the motor stool (341).
5. Tighten the lower bolts of the coupling shells (862) in such way, that the coupling slightly clamps around the motor shaft.
6. Lift the pump assembly to the maximum upwards position and mark the shaft. Use a tyre lever to lift the coupling.

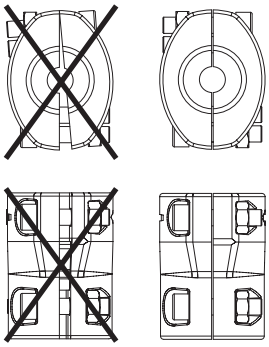
ATTENTION
For motors of 11 kW or higher, block the rotor when adjustments are made to the coupling. This ensures that the rotor will not come out of its bearings.



20070376

WARNING
Correct seal tension max. -1 mm lower than the maximum upwards position!

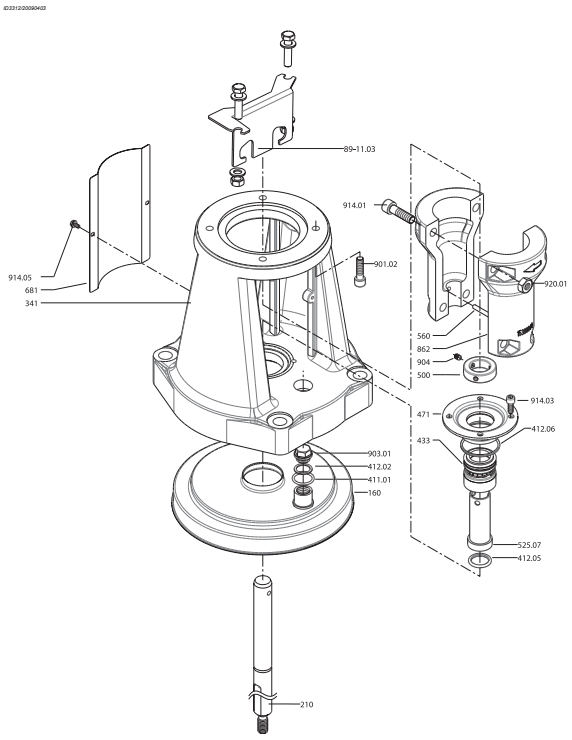
7. Position the pump assembly 1 mm lower than the maximum upwards position as mentioned earlier.
8. Fully tighten the couplings at the given torque (see "Torques" in the annexes). Make sure that the gaps between the couplings are equally divided on both sides (see drawing).



20030733

9. Attach the coupling guards (681) with the socket head cap screws (914.05) to the motor stool (341).
10. Connect the electricity supply to the motor. see § 7.3 Electrical install.

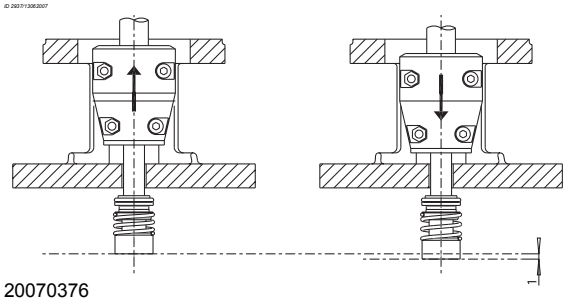
7.2.2 Installing the motor on pumps, supplied without motor, with a cartridge seal



20090322/20090402

1. Remove the couplingguards (681) and the coupling shells (862).
2. Remove the sealprotection bracket (89-11.03) and its mounting material. For pumps with a taper piece (722) (with motor of 5.5 kW or higher), the two bolts (914.02 or 901.02) has to be placed back to connect the taper piece to the motor stool. Thoroughly clean the motor stool (341), the shaft (210), the coupling shells (862) and the motor shaft.
3. Loosely fasten the coupling shells (862) with the coupling pin (560) on the shaft (210). Use the hexagon socket head cap screw (914.01) and the nut (920.01) for this. (When the pump is equipped with a steel coupling, never use the same coupling twice but order a new one).
4. Place the motor on the motor stool (341).
5. Loosen the three cartridge grub screws (904) one turn.
6. Push the hydraulic pump assembly in the lowest position.
7. Tighten the three cartridge grub screws (904) firmly to the shaft.
8. Tighten the lower bolts of the coupling shells (862) so that the coupling slightly clamps around the motor shaft.
9. Lift the pump assembly to the maximum upwards position and mark the shaft.Use a tyre lever to lift the coupling.

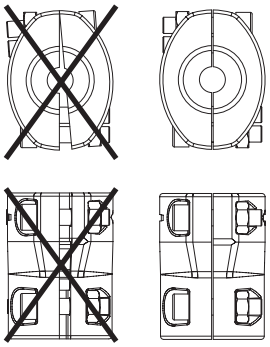
ATTENTION
For motors of 11 kW or higher, block the rotor when adjustments are made to the coupling. This ensures that the rotor will not come out of its bearings.



20070376

WARNING
Correct seal tension max. -1 mm lower than the maximum upwards position!

10. Position the pump assembly 1 mm lower than the maximum upwards position as mentioned earlier.
11. Fully tighten the couplings at the given torque (see "Torques" in the annexes). Make sure that the gaps between the couplings are equally divided on both sides (see drawing).



20030733

12. Install the coupling guards (681) with the socket head cap screws (914.05) to the motor stool (341).

13. Electrically connect the motor. See § 7.3 Electrical install.

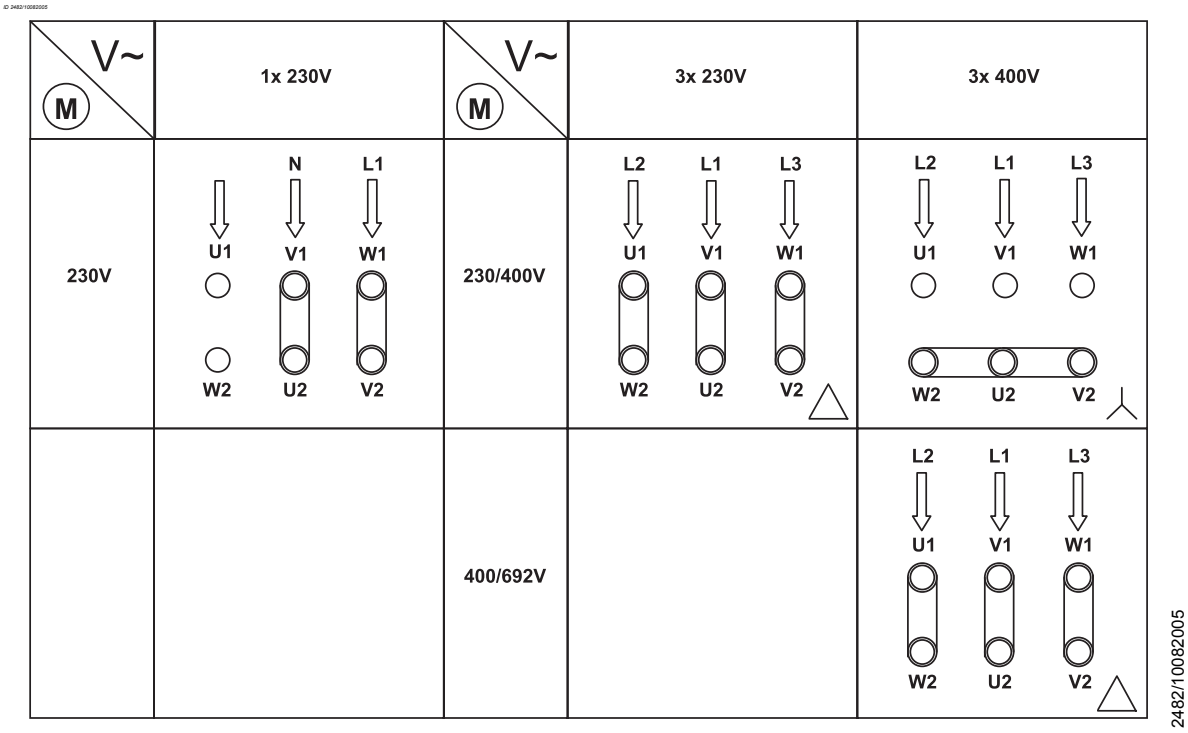
7.3 Electrical install

WARNING
Only authorised personnel is allowed to make electrical connections to the motor. This is in accordance with the local regulations.

ATTENTION
After connecting the motor according to the diagram always check the rotation direction.

Electrical connections:

- Make sure that the motor specifications correspond with the power supply to which the pump motor is connected. Consult "Electrical diagrams" in the annexes for the correct connection diagram.
- Connect the motor using a motor safety switch.



PTC connection STM 140 EK:

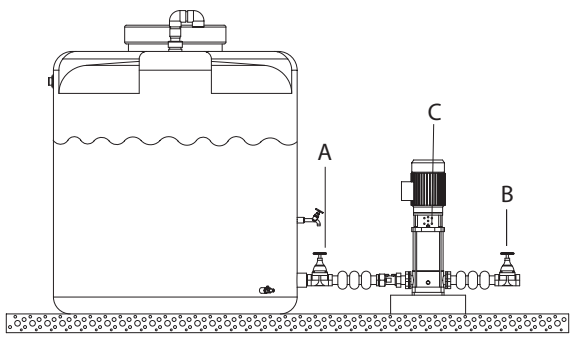
- All motors 3 kW and up are equipped with a PTC thermistor. Consult: 11.2Technical specifications 42.
- Connect the PTC on a thermistor relais.

ATTENTION
Seen from the top of the motor the pump should rotate clockwise (B) See 7.1.1 Indicators . In case of a 3-phase motor the rotating direction can be changed by exchanging two of the three phase wires.

7.4 Commissioning

WARNING
The pump must not be switched on when it is not completely filled up.

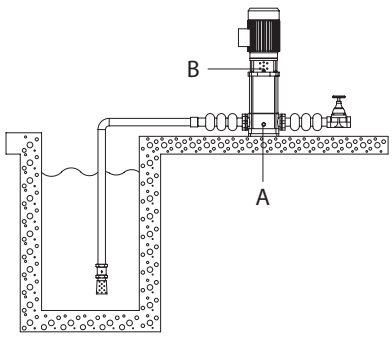
7.4.1 In an open or closed circuit with sufficient supply pressure



0239/24062003

1. Close the suction shut-off valve (A) and the outlet shut-off valve (B).
2. Open the fill plug (C).
3. Gradually open the suction shut-off valve until the liquid flows from the fill plug (C).
4. Close the fill plug.
5. Fully open the suction shut-off valve.
6. Check the rotational direction of the pump.
7. Fully open the outlet shut-off valve.

7.4.2 In an open circuit with a liquid level lower than the pump



0241/24062003

1. Partly loosen the drain plug (A). For DPVE , DPVCF and DPLHS the drain plug must be fully removed.
2. Remove the fill plug (B) from the top bracket.
3. Block the entry of the drain plug on the outside of the pump foot.
4. Close the outlet shut-off valve.
5. Fill the pump housing to the maximum through the fill plug with the liquid that is to be pumped.
6. Screw the drain plug into the pump foot.
7. Insert the fill plug in the top bracket.
8. Check the rotational direction of the pump.
9. Open the outlet shut-off valve.

7.4.3 After an extended period of non-operation or storage

During first start-up, be sure to check the mechanical seals for leakage due to seizure or dehydration of the lubricating film. If this is the case, please proceed as follows:

1. Turn shaft manually or;
2. Start up the pump, then open and close the outlet shut-off valve quickly during operation.
3. Check if the mechanical seal is still leaking.

If the shaft is still leaking:

1. Disassemble the mechanical seal.
2. Thoroughly clean and degrease the running surfaces.
3. Assemble the mechanical seal again and retry start-up.

If this doesn't solve the shaft leakage, replacement of the mechanical seal is necessary.

8 Operation

8.1 Operation

The pump is controlled externally and therefore does not need any operation guidance.

9 Maintenance

9.1 Introduction

WARNING
Observe the general safety precautions for installation, maintenance and repair.

Regular maintenance is necessary for the correct operation a pump. For maintenance of the pump, please contact your supplier.

9.2 Lubrication

Standard motors, with a maximum power of 7.5 kW, are provided with maintenance free sealed bearings.

Motors with lubricating nipples must be lubricated after 2000 hours. If the pump works under extreme conditions, such as vibrations and high temperatures, the motors must be lubricated more often.

Use a lithium based -30 °C / 160 °C bearing lubricant (about 15 gram).

When the pump is delivered without a motor and fitted with an other brand or the standard motor is replaced by an other brand than DP-Pumps, please consult the maintenance instructions of the motor supplier.

ATTENTION
Also follow the instructions in § 7.2 Mounting a motor on the pump.

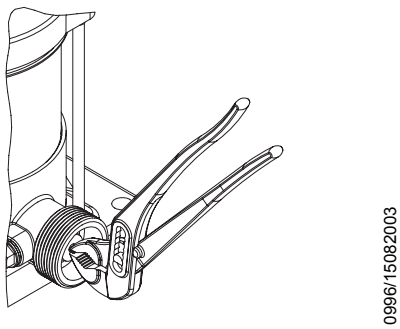
9.3 Maintaining the pump for an extended period of non-operation

Turn the shaft every three months. This protects the seals from seizure.

Protect the pump against if there is a risk of frost. Proceed as follows:

1. Close all pump valves.
2. Drain each pump and/or the system.
3. Remove all plugs from the pump.
4. Open the shut-off and fill/air vent plug, if present.

9.4 Replace DPVE non-return valve



0996/15082003

To replace the non-return valve of the pump types DPVE, proceed as follows:

1 Use a pair of pliers to remove the non-return valve.
2 Remove the O-ring.
3 Install a new O-ring.
4 Install the new non-return valve.

10 Failures

10.1 Failure table

WARNING
Observe the general safety precautions before install, maintenance and repair.

Problem	Possible cause	Possible solution	Checkpoints
Leakage along the shaft	Running surfaces of the mechanical seal worn or damaged	Replace the mechanical seal.	Check the pump for dirt - abrasive parts.
	New pump: seal stuck due to assembly	Open and close the outlet shut-off valve quickly during operation	
	mechanical seal mounted incorrectly	Install the mechanical seal correctly. Use water and soap as a lubricant	
	Elastomers affected by medium	Use a the right rubber compound for the mechanical seal	
	Pressure too high	Use the right type of mechanical seal	
	Shaft worn	Replace shaft and mechanical seal	
	Pump has been operating without water	Replace the mechanical seal	
Leakage along the shroud at the top bracket or at the pump foot	O-ring worn	Replace the O-ring	
	O-ring not resistant to the medium to be pumped	Replace O-ring by an O-ring with better resistance	
	Too much tension on the pump foot; it becomes oval	Decrease tension on piping Mount the pump foot tensionless Support the connections.	

Problem	Possible cause	Possible solution	Checkpoints
Pump is vibrating or noisy	Coupling mounted incorrectly	Install the coupling in parallel	
	Faulty setting of the hydraulic assembly	Adjust the assembly according to the manual	
	There is no water in the pump	Fill and vent the pump	
	No supply	Make sure there is sufficient supply. Check for blockages in the supply line	
	Bearings of pump and/or motor worn	Have the bearings replaced by a certified company	
	Available NPSH too low (cavitation)	Improve suction condition	
	Pump does not work in its working range	Select another pump or adjust the system to work within its working range	
	Pump is standing on an uneven surface	Level the surface	
Malfunction	Internal blockage in the pump	Have the pump inspected by a certified company	
Pump does not start	No voltage on the terminal clamps	Check the power supply	• Circuit • Main switch • Fuses
		Check the motor safety relay	• Earth leakage switch • Protective relay
	Thermal motor safety switch triggered	Reset the thermal motor-safety. Contact the supplier, if this problem occurs more often.	Check if the correct value is set. Find the correct value (I_{nom}) on the motortype plate
The motor is running, but the pump does not work	The pump shaft has been broken	Contact the supplier	
	The coupling between pump- and motor shaft is loose	Tighten the connecting screws to the recommended torque	

Problem	Possible cause	Possible solution	Checkpoints
Pump supplies insufficient capacity and/or pressure	Outlet and/or inlet shut-off valve is closed	Open both shut-off valves	
	There is air in the pump	Vent the pump	
	The suction pressure is insufficient	Increase the suction pressure	
	Pump rotates in the wrong direction	Change over L1 and L2 of the three phase supply.	
	The suction line has not been vented	Vent the suction line	
	Air bubble in the suction line	Install the suction line with pump end higher than the other end	
	Pump sucks air because of leakage in the suction line	Repair the leakage	
	Too little water consumption so air bubbles clog up in the pump	Make sure the consumption increases or use a smaller pump	
	The diameter of the suction line is too small	Increase the diameter of the suction line	
	Capacity of water meter in the supply line is too small	Increase the capacity of the water meter	
	Foot valve blocked	Clean the foot valve	
	The impeller or the diffuser is blocked	Clean the inside of the pump	
	O-ring between impeller and diffuser is gone	Replace the O-rings	
	O-ring not resistant to the medium to be pumped	Replace O-ring by an O-ring with better resistance	

11 Annexes

11.1 Spare part kits

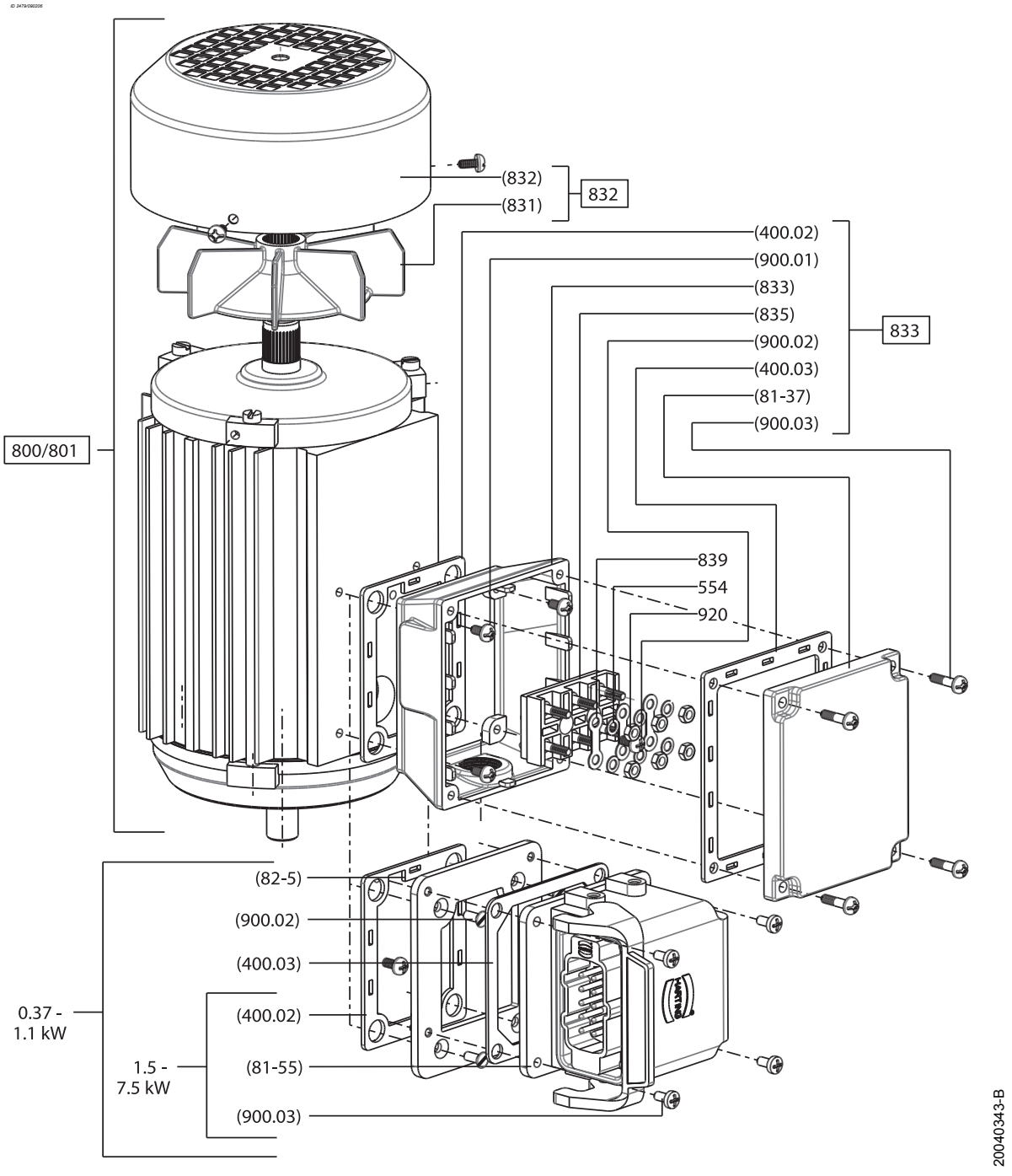
Spare part Kit	Kit Nr
Fan Hood Kit Fan hood (832) + Fan Impeller (831)	**832**
Coupling Kit 4/6 x Nut (920.01) + 4/6 x hexagon socket head cap screw (914.01) + 2 x coupling shell (862) + coupling pin (560)	**862**
Drain / air relief plug Kit Screwed plug (903.01) + joint ring (411.01) + screwed plug (903.02) + joint ring (411.02)	**903**
Stage casing compl. with bearing Kit Stage casing with bearing (108.02) + bearing sleeve (529) + impeller (230) + spacer sleeve short (525.01)	**10-5**
Spacer sleeve Kit 2 x Spacer sleeve short (525.01) + 6 x spacer sleeve long (525.03) + spacer sleeve (525.08) + spacer sleeve seal (525.05)	**525**
Sealing Kit Mechanical seal (433) + 2 x O-ring (412.01) + 2 x gasket (400)	**433**
Shaft end Kit Spacer sleeve end (525.04) + lock nut (920.02) + safety device, Nord-lock (930) + circlip (932)	**81-88**
Flange Kit 2 x Flange (723) + 4/8/16 x hexagon head bolt (901.03) + 0/4/8/16 x nut (920) + 4/8/16/32 x washer (554.03) + 2 x gasket (400)	**723**
Terminal box kit Gasket (400.02) + terminal box (833) + terminal board (835) + gasket (400.03) + terminal box coverplate (81.37) + 4 x screw (900)	**833**
Capacitor Capacitor (837)	**837**

11.1.1 Parts list

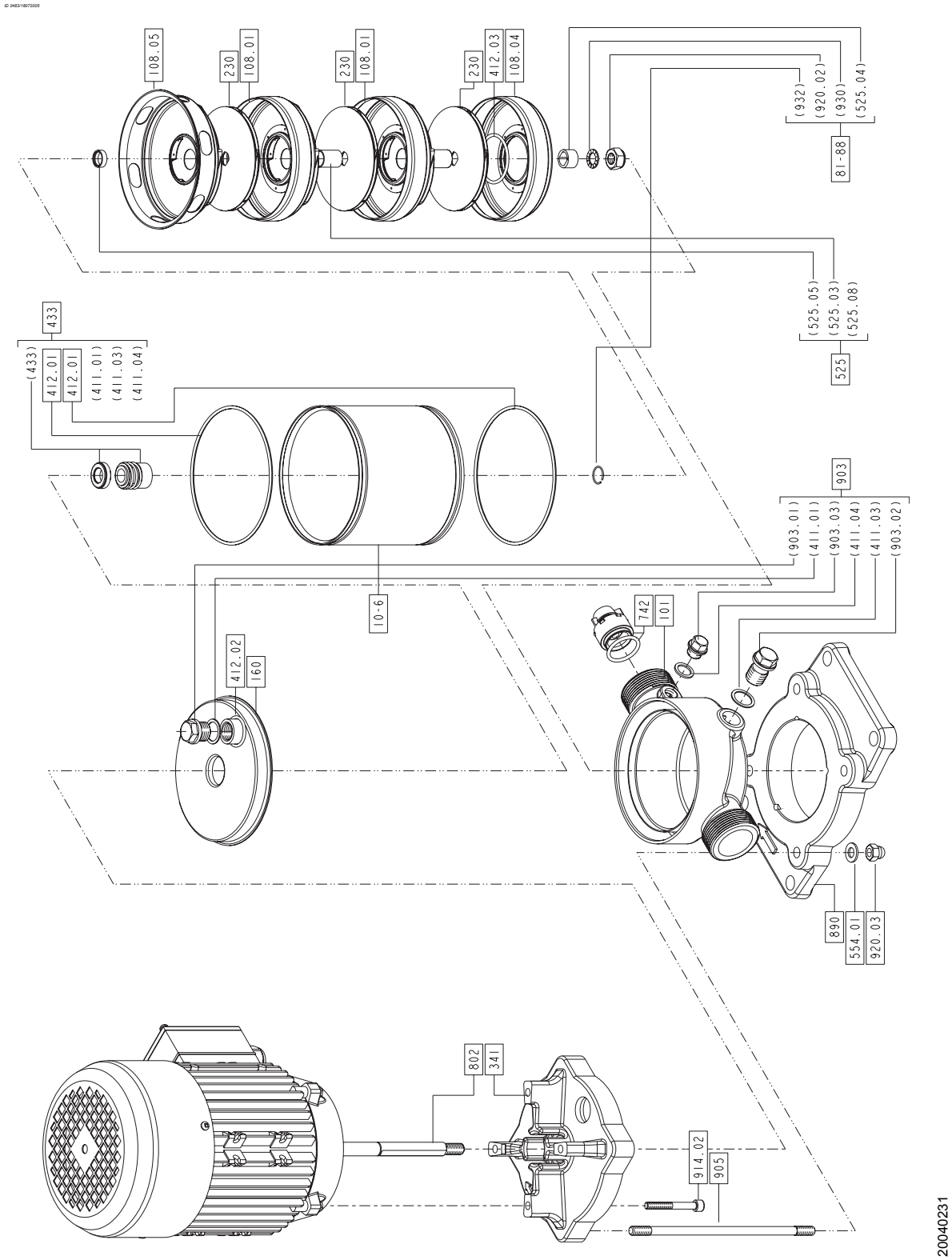
number (ZN)	name
101	Pump casing
108	Stage casing
160	Cover
171	Diffuser
210	Shaft
230	Impeller
341	Motor stool
400	Gasket
411	Joint ring
412	O-ring
433	Mechanical seal
471	Seal cover
500	Ring
509	Intermediate ring

number (ZN)	name
525	Spacer sleeve
525.08	Spacer sleeve
529	Bearing sleeve
554	Washer
560	Pin
681	Coupling guard
722	Taper piece, flanged
723	Flange
742	Non-return valve
800	Motor
801	Flanged motor
802	Motor for close coupling
831	Fan impeller
832	fan hood
833	Terminal box
835	Terminal board
837	Condenser
862	Coupling shell
890	Baseplate fabricated or cast
900	Screw
901	Hexagon head bolt
903	Screwed plug
904	Grub screw
905	Tie bolt
913	Vent plug
914	Hexagon socket head cap scr.
920	Nut
930	Safety device
932	Circlip
10-6	Pump shroud
81-37	Terminal box coverplate

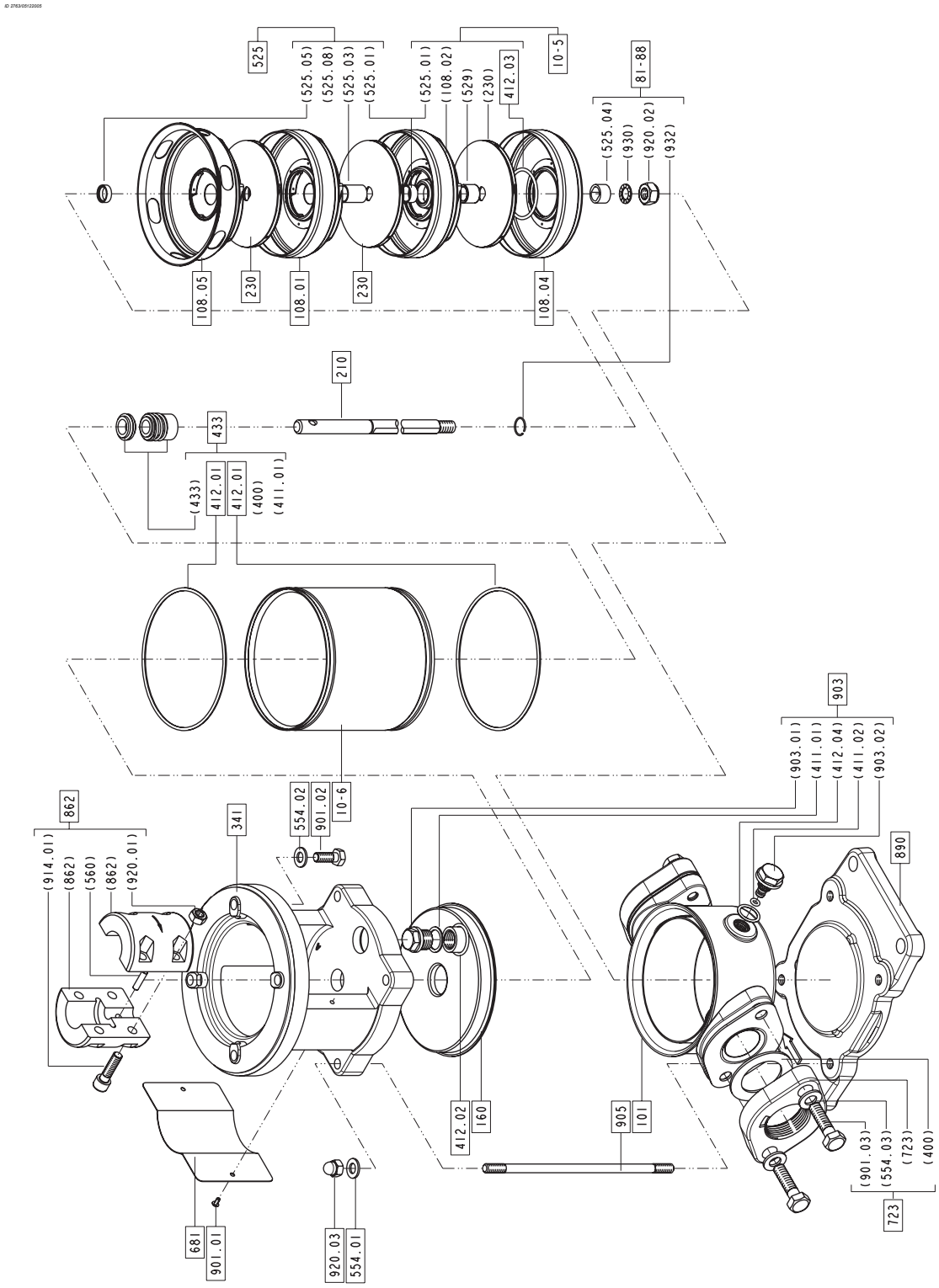
11.1.2 Parts drawing motor



11.1.3 Parts drawing DPVE 2/4/10/14

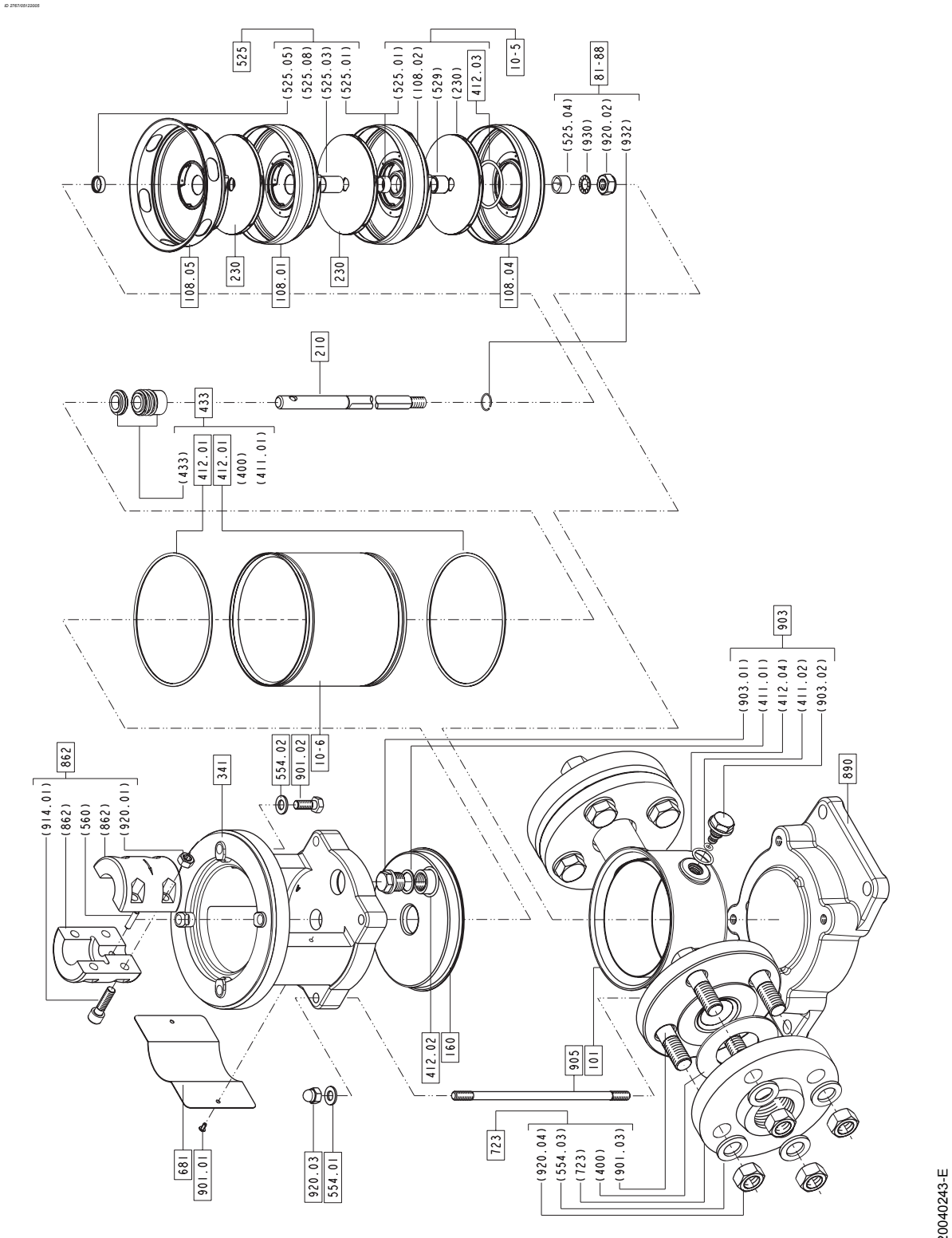


11.1.4 Parts drawing DPV 2/4/10/14/18



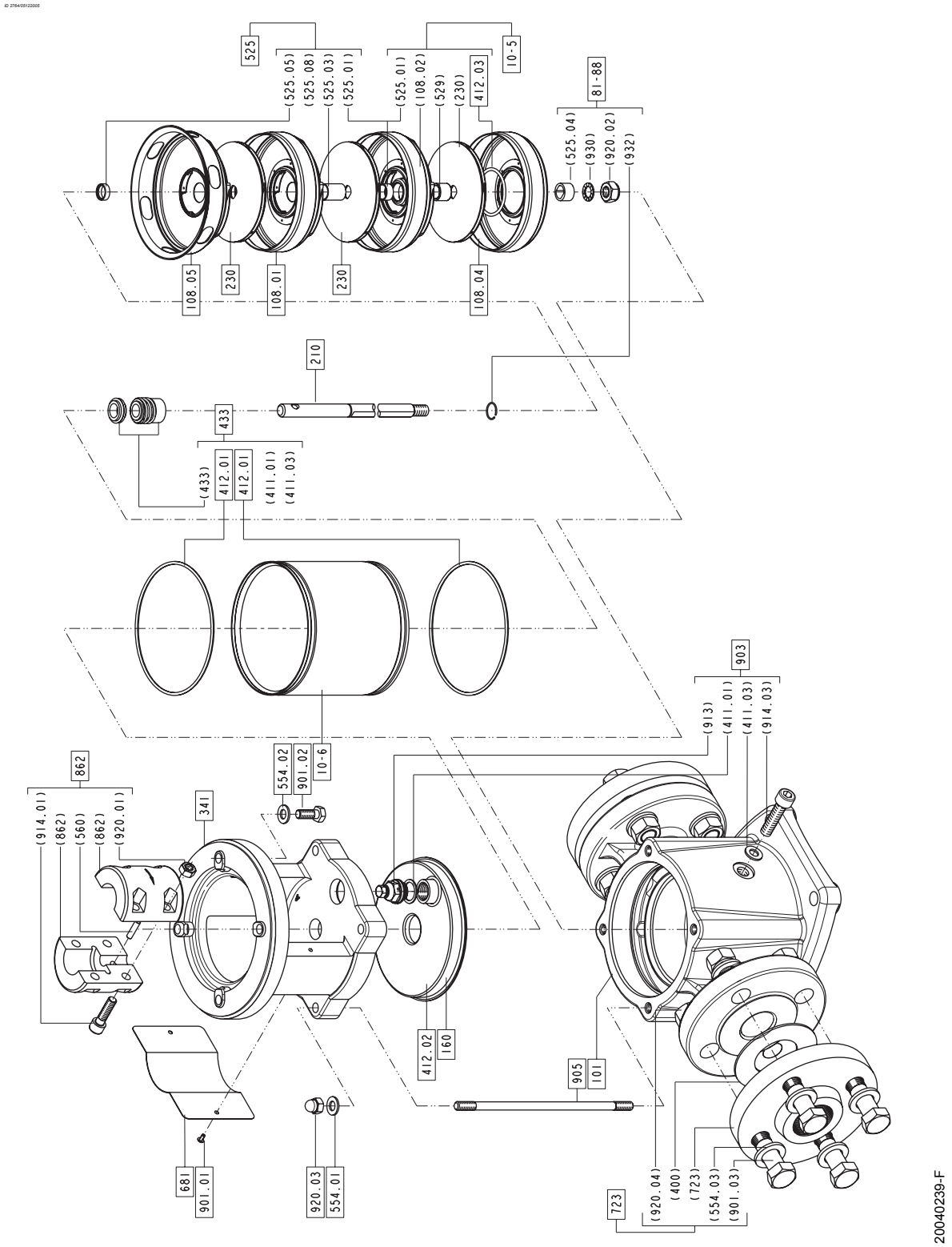
20040230-F

11.1.5 Parts drawing DPVF 2/4/10/14/18



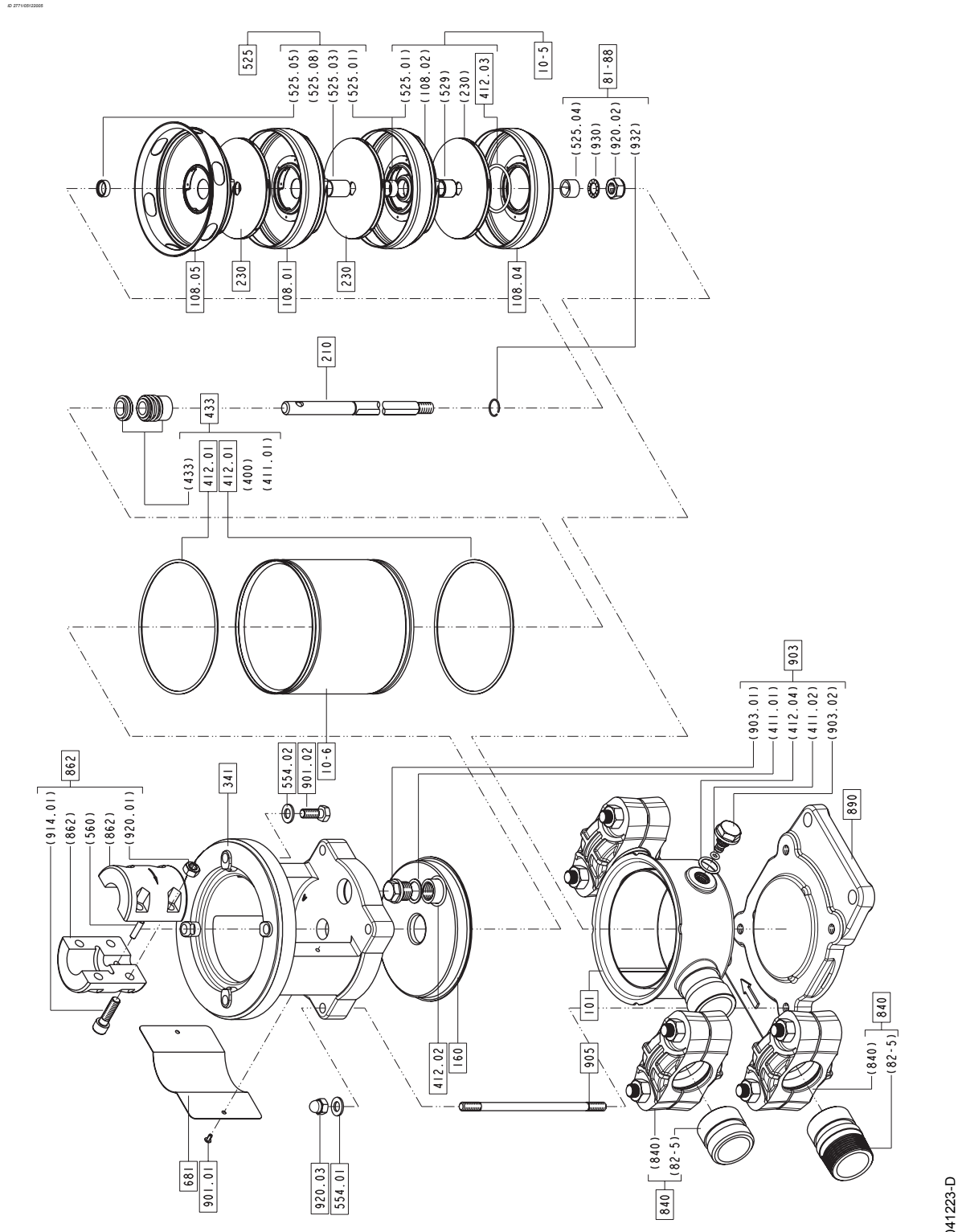
20040243-E

11.1.6 Parts drawing DPVCF2/4/10/18



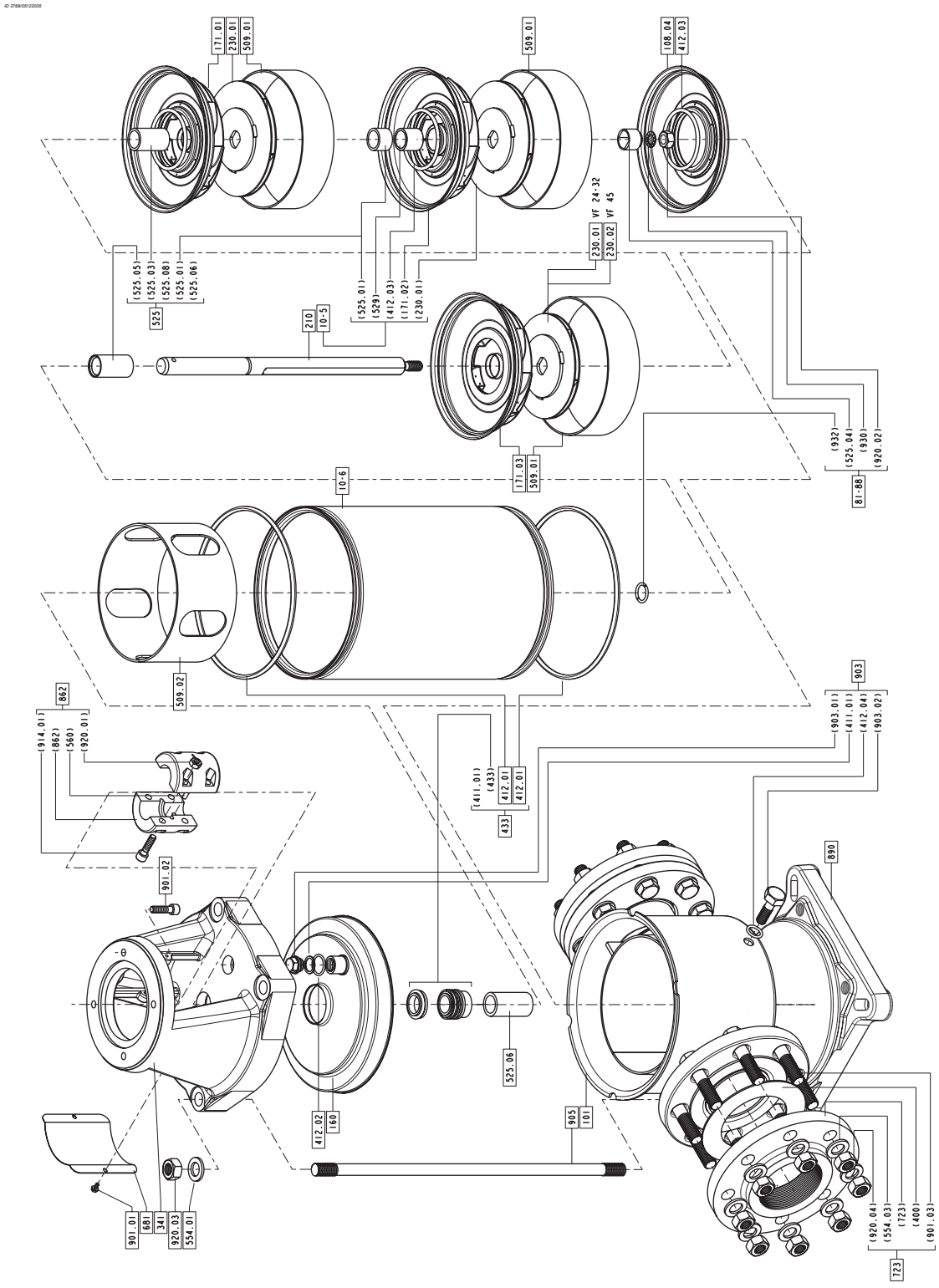
20040239-F

11.1.7 Parts drawing DPVV2/4/10/14/18



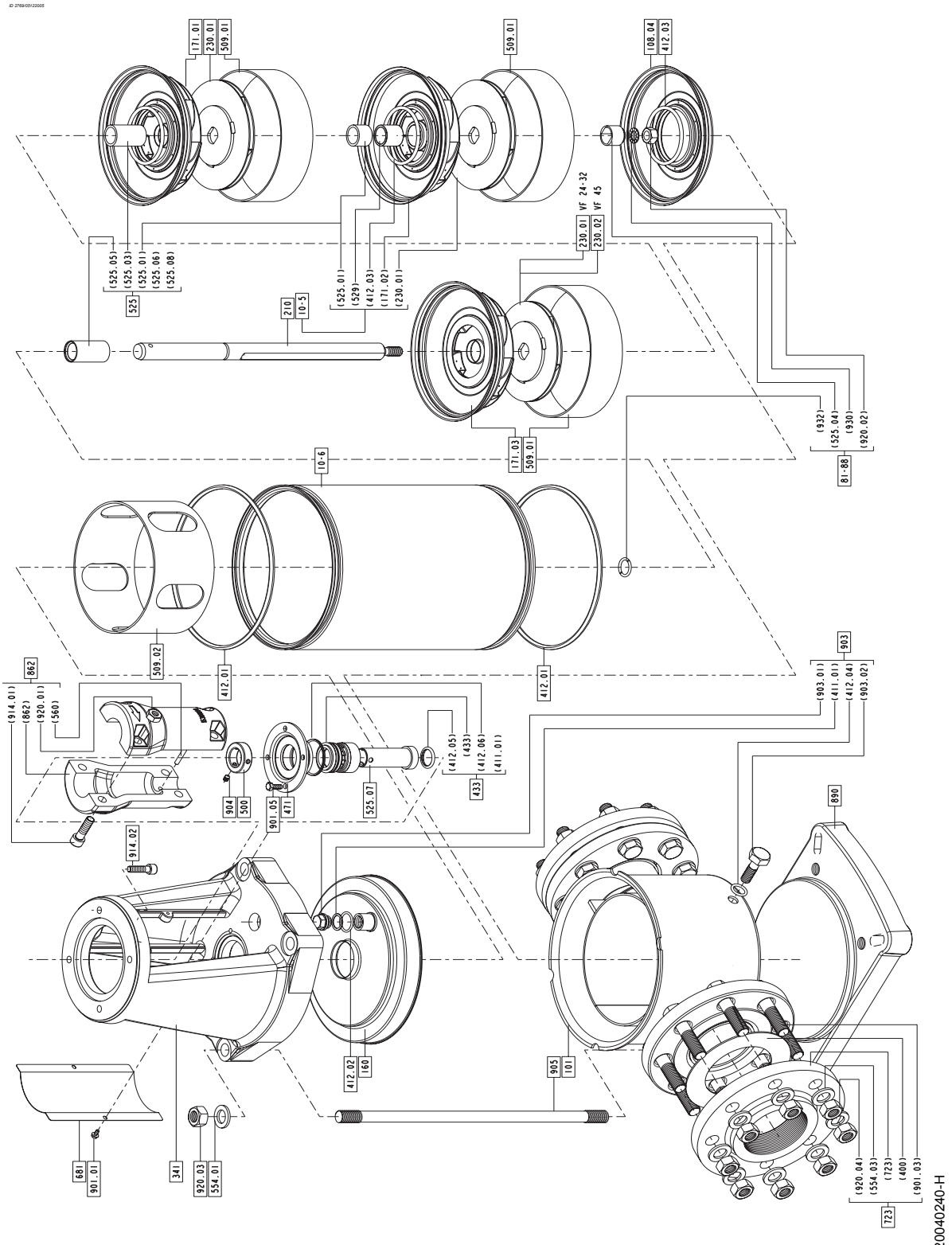
20041223-D

11.1.8 Parts drawing DPVF 24/32/45

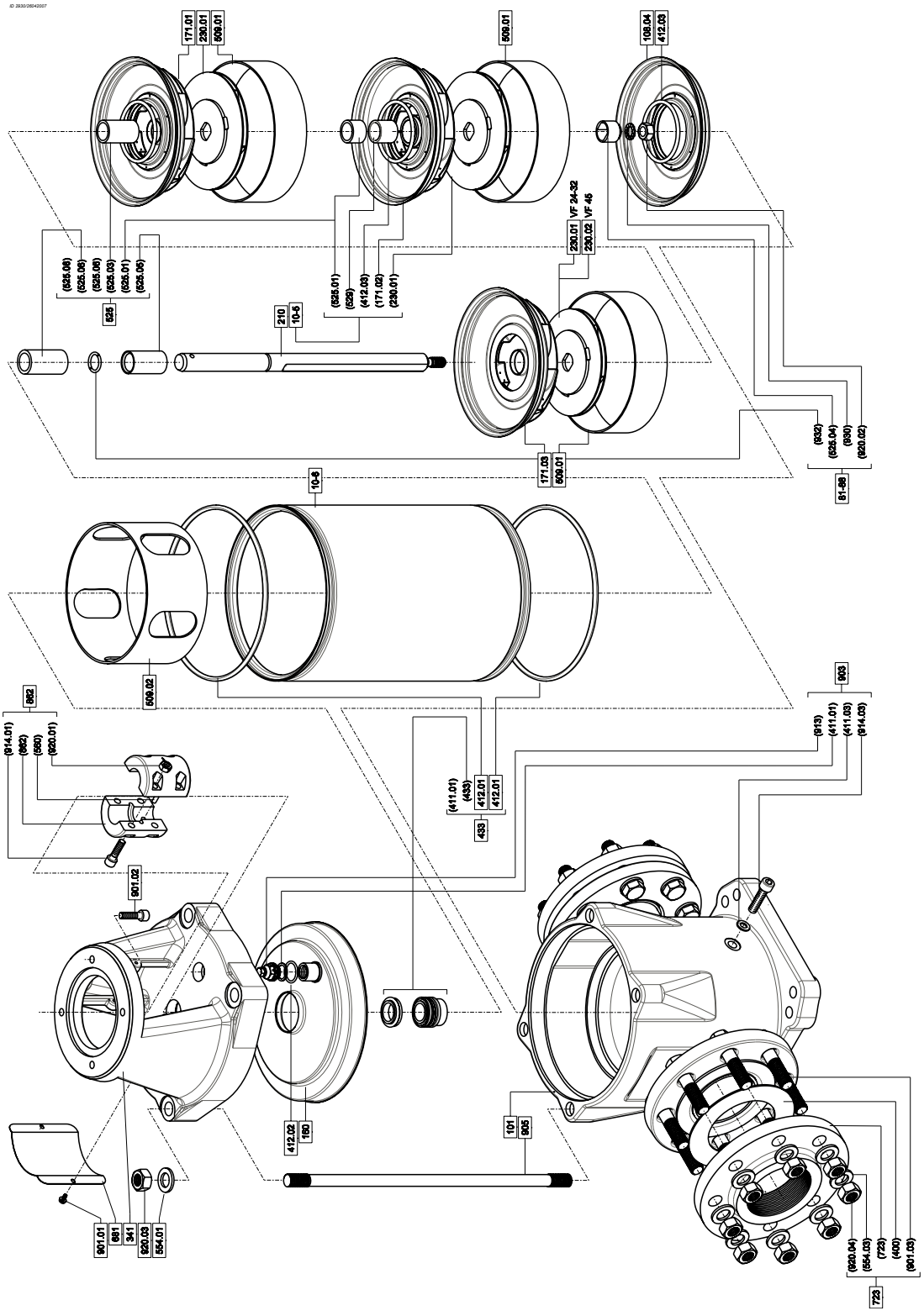


20010717-E

11.1.9 Parts drawing DPVF 24/32/45 with cartridge seal

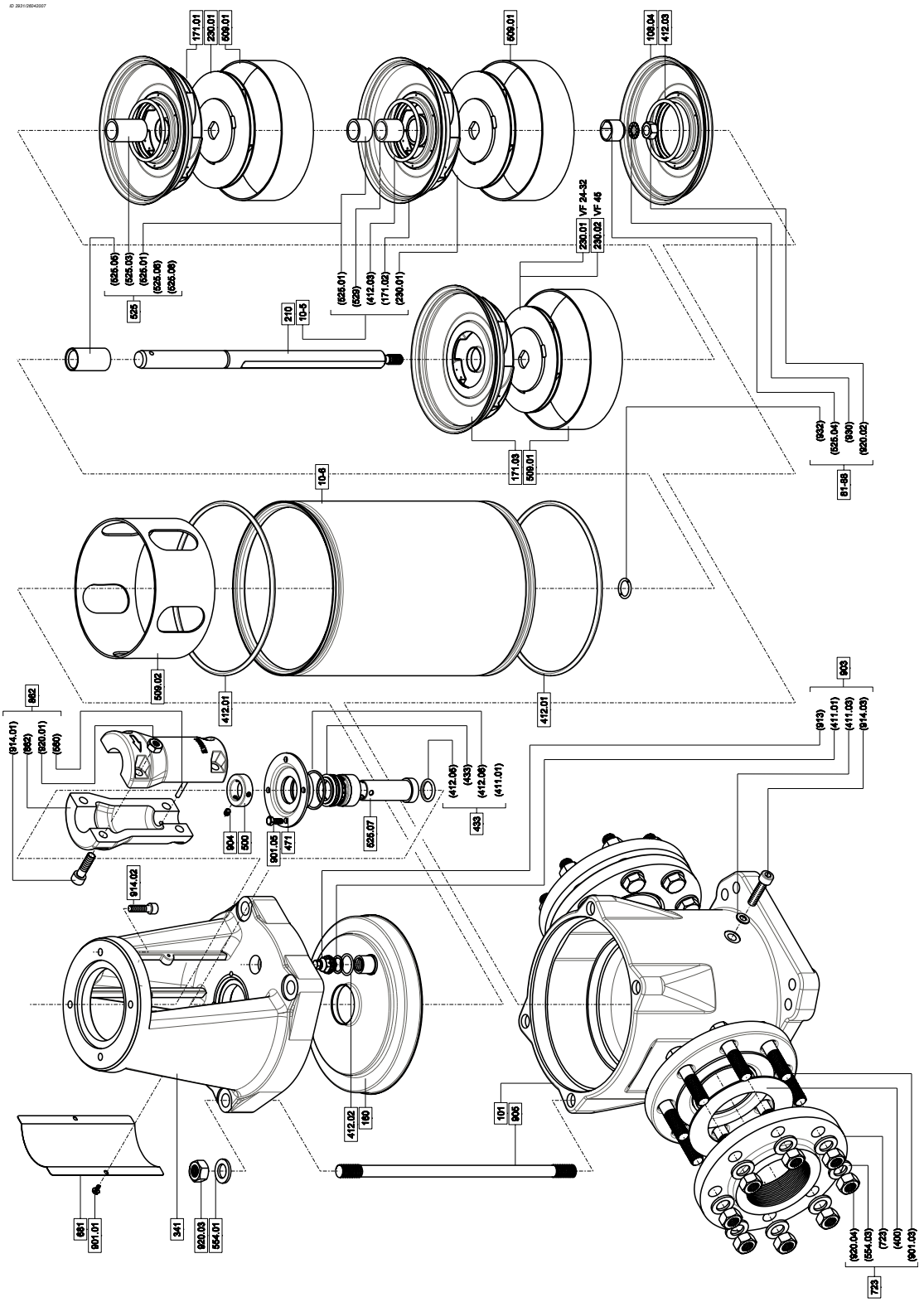


11.1.10 Parts drawing DPVCF 32/45



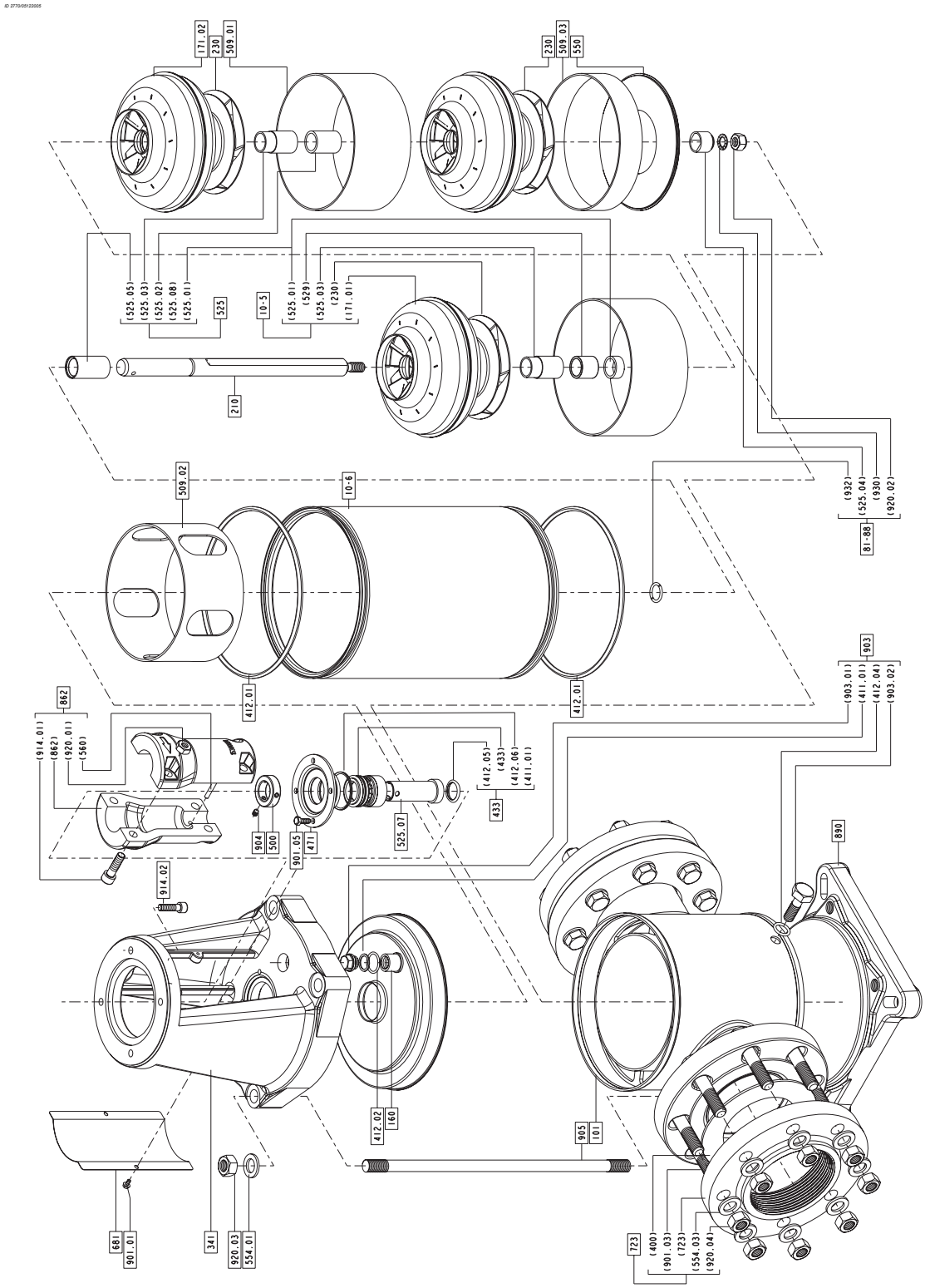
20070213-B

11.1.11 Parts drawing DPVCF 32/45 with cartridge seal



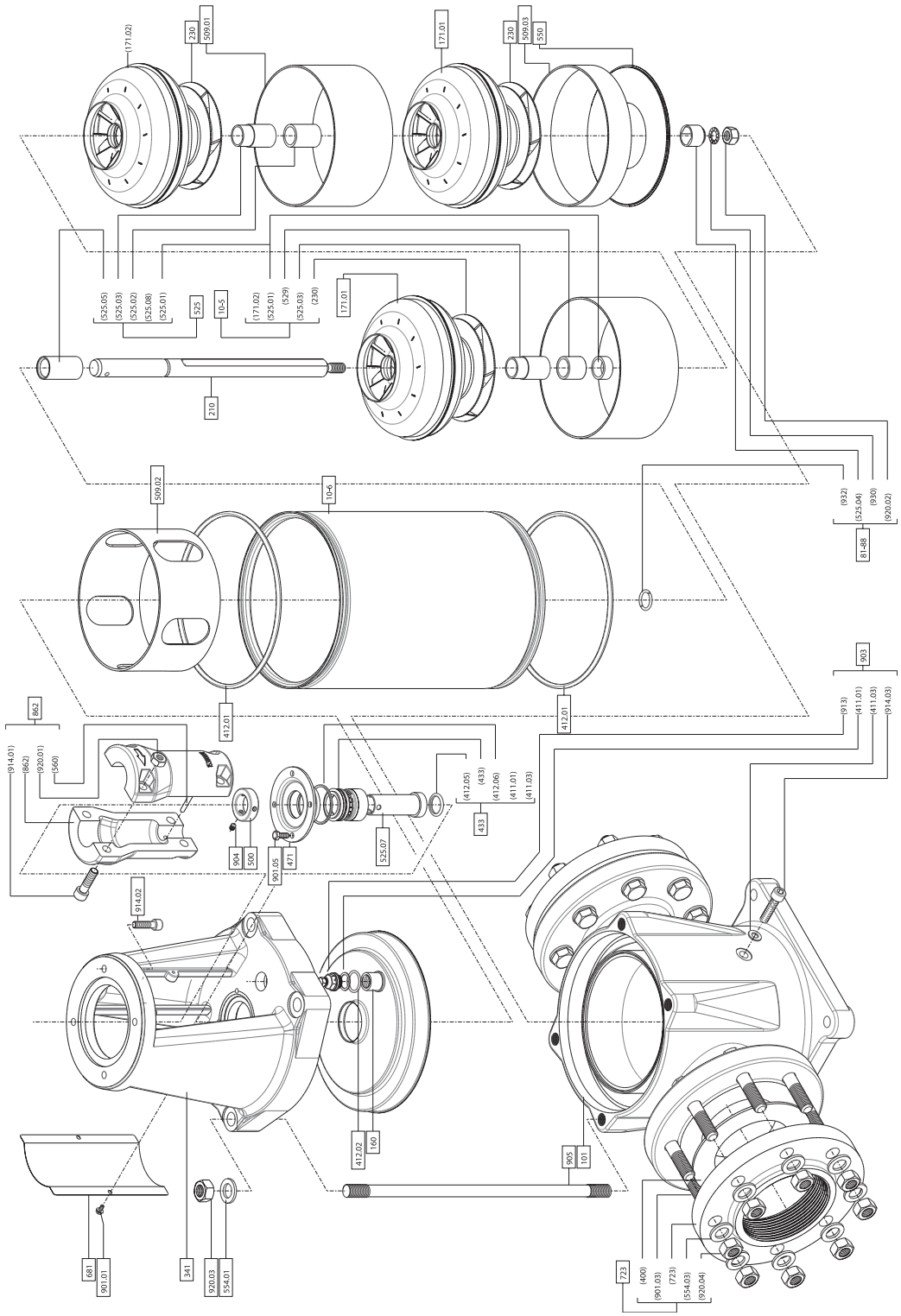
20070216-B

11.1.12 Parts drawing DPVF 65



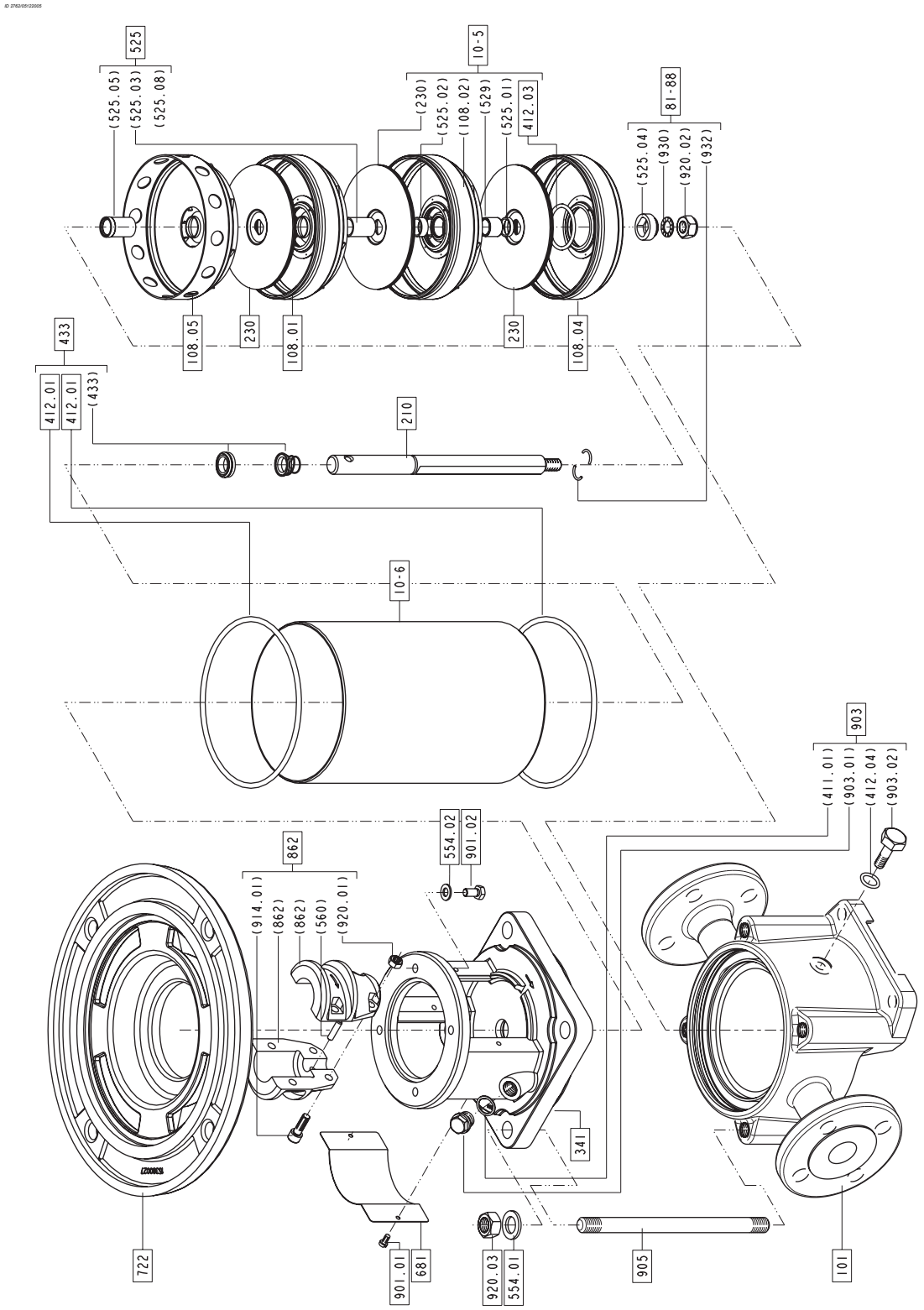
99000539-J

11.1.13 Parts drawing DPVCF 65



20041205-F

11.1.14 Parts drawing DPLHS 6



20040232-D

11.2 Technical specifications

ATTENTION
The motor data are only applicable for standard motors delivered with the pump and are not applicable for explosion proof motors.

ATTENTION
*** motors are equiped with a PTC.**

Table 8: Technical specifications of pumps with 2-pole, 1 phase, 50 Hz motors

P [kW]	P [HP]	η [%]	L_p [dB(A)]	Max. starts [h^{-1}]	n [min^{-1}]	C [µF]	I max [A]		
							220V	230V	240V
0.37	0.5	63	64	10	2750	16	2.9	2.9	2.9
0.55	0.75	64	64	10	2750	20	4.5	4.5	4.5
0.75	1	63	67	10	2750	20	6.9	6.9	6.9
1.1	1.5	64	67	10	2750	30	8.7	8.7	8.7
1.5	2	67	67	10	2750	40	11	11	11
2.2	3	74	71	10	2820	60	15.2	15.2	15.2

Table 9: Technical specifications of pumps with 2-pole, 3 phase, 50 Hz motors

P [kW]	P [HP]	η [%]	L_p [dB(A)]	Max. starts [h^{-1}]	n [min^{-1}]	I max [A]								
						△			⅄					
									△			⅄		
						220V	230V	240V	380V	400V	420V	660V	692V	725V
0.37	0.5	76	60	50	2865	2.5	2.4	2.3	1.5	1.4	1.3			
0.55	0.75	82	60	50	2880	2.7	2.6	2.5	1.6	1.5	1.4			
0.75	1	80	60	50	2865	3.9	3.7	3.6	2.2	2.1	2			
1.1	1.5	83	60	50	2890	5.9	5.8	5.5	3.4	3.3	3			
1.5	2	84.1	69	30	2880	7.6	7.6	7.6	4.4	4.4	4.4			
2.2	3	85.6	72	30	2875	10.4	10.4	10.4	6	6	6			
3*	4	83.6	67	20	2915	13.3	13.3	13.3	7.7	7.7	7.7	4.4	4.4	4.4
4*	5	87.3	69	20	2935	16.8	16.8	16.8	9.7	9.7	9.7	5.6	5.6	5.6
5.5*	7.5	86	74	15	2890	20.8	20.8	20.8	12	12	12	6.9	6.9	6.9
7.5*	10	86.8	70	12	2880	26.8	26.8	26.8	15.5	15.5	15.5	8.9	8.9	8.9
11*	15	89.3	74	10	2950	52.8	52.8	52.8	30.5	30.5	30.5	17.6	17.6	17.6
15*	20	90.5	74	10	2920	54.9	54.9	54.9	31.7	31.7	31.7	18.3	18.3	18.3
18.5*	25	91	74	10	2930	70.1	70.1	70.1	40.5	40.5	40.5	23.4	23.4	23.4
22*	30	90.6	87	10	2920	77.1	77.1	77.1	44.5	44.5	44.5	25.7	25.7	25.7
30*	40	93	74	6	2960	102.3	97.5	93.4	59.2	56.3	53.6	34.0	32.4	N-A
37*	50	93	74	6	2960	118.7	113.5	108.8	68.7	65.3	62.2	39.7	37.8	N-A

Table 10: Technical specifications of pumps with 4-pole, 3 phase, 50 Hz motors

P [kW]	P [HP]	η [%]	L_p [dB(A)]	Max. starts [h^{-1}]	n [min^{-1}]	I max [A]								
						△			⅄					
									△			⅄		
						220V	230V	240V	380V	400V	420V	660V	692V	725V
0.55	0.75	73	58	50	1450	4.7	4.5	4.3	2.7	2.6	2.5			
0.75	1	74	58	50	1450	6	5.7	5.5	3.8	3.3	3.1			
1.1	1.5	76.7	60	30	1405	5.2	5.2	5.2	3	3	3			
1.5	2	79	58	30	1410	7.1	7.1	7.1	4.1	4.1	4.1			
2.2	3	82	61	20	1425	9	9	9	5.2	5.2	5.2			
3*	4	78.4	64	20	1430	14	14	14	8.1	8.1	8.1	4.7	4.7	4.7
4*	5	85	65	20	1445	17.2	17.2	17.2	9.9	9.9	9.9	5.7	5.7	5.7
5.5*	7.5	85.9	64	15	1450	20.8	20.8	20.8	12	12	12	6.9	6.9	6.9
7.5*	10	87	64	10	1450	27.7	27.7	27.7	16	16	16	9.2	9.2	9.2

Table 11: Technical specifications of pumps with 2-pole, 3 phase, 60 Hz motors

P [kW]	P [HP]	η [%]	L_p [dB(A)]	Max. starts [h^{-1}]	n [min^{-1}]	I max [A]								
						△			⅄					
									△			⅄		
						220V	240V	280V	380V	420V	480V	660V	725V	797V
0.37	0.5	76.0	60	50	3430	2.5	2.3	2.0	1.5	1.3	1.2			
0.55	0.75	82.0	60	50	3460	2.7	2.5	2.1	1.6	1.4	1.2			
0.75	1	80.0	60	50	3430	3.9	3.6	3	2.2	2	1.8			
1.1	1.5	82.0	60	50	3470	5.9	5.5	4.3	3.4	3	2.7			
1.5	2	84.1	69	30	3455	7.8	7.8	7.8	4.5	4.5	4.5			
2.2	3	85.6	72	30	3450	10.9	10.9	10.9	6.3	6.3	6.3			
3*	4	83.6	67	20	3495	13.6	13.6	13.6	7.9	7.9	7.9	4.6	4.6	4.6
4*	5	87.3	69	20	3520	17.2	17.2	17.2	9.9	9.9	9.9	5.7	5.7	5.7
5.5*	7.5	86	74	15	3465	21	21	21	12.1	12.1	12.1	7	7	7
7.5*	10	86.8	70	12	3455	26.8	26.8	26.8	15.5	15.5	15.5	8.9	8.9	8.9
11*	15	89.3	74	10	3540	53.7	53.7	53.7	31	31	31	17.9	17.9	17.9
15*	20	90.5	74	10	3500	56.3	56.3	56.3	32.5	32.5	32.5	18.8	18.8	18.8
18.5*	25.0	91	74	10	3515	72.1	72.1	72.1	41.6	41.6	41.6	24	24	24
22*	30.0	90.6	87	10	3500	78.8	78.8	78.8	45.5	45.5	45.5	26.3	26.3	26.3
30*	40.0	93	74	6	3552	102.3	93.4	N-A	59.2	53.6	N-A	34	N-A	N-A
37*	50.0	93	74	6	3552	118.7	108.8	N-A	68.7	62.2	N-A	39.7	N-A	N-A

Table 12: Technical specifications of pumps with 4-pole, 3 phase, 60 Hz motors

P [kW]	P [HP]	η [%]	L_p [dB(A)]	Max. starts [h^{-1}]	n [min^{-1}]	I max [A]								
						△			Y					
									△			Y		
						220V	240V	280V	380V	420V	480V	660V	725V	797V
0.55	0.75	73	58	50	1740	4.7	4.3	3.7	2.7	2.5	2.2			
0.75	1	74	58	50	1740	6	5.5	4.7	3.8	3.1	2.8			
1.1	1.5	76.7	60	30	1685	4.8	4.8	4.8	2.8	2.8	2.8			
1.5	2	79	58	30	1690	6.5	6.5	6.5	3.7	3.7	3.7			
2.2	3	82	61	20	1710	8.4	8.4	8.4	4.9	4.9	4.9			
3*	4	78.4	64	20	1715	14.5	14.5	14.5	8.4	8.4	8.4	4.9	4.9	4.9
4*	5	85	65	20	1725	17.5	17.5	17.5	10.1	10.1	10.1	5.8	5.8	5.8
5.5*	7.5	85.9	64	15	1740	19.8	19.8	19.8	11.5	11.5	11.5	6.6	6.6	6.6
7.5*	10	87	64	10	1740	27	27	27	15.6	15.6	15.6	9	9	9

Table 13: Technical specifications PTC STM 140 EK

	Value
t_n [°C]	140
$R_{20\ °C}$ [Ω]	~ 20
$R_{tn-20\ °C}$ [Ω]	~ 250
$R_{tn-5\ °C}$ [Ω]	< 550
$R_{tn+5\ °C}$ [Ω]	> 1330
$R_{tn+15\ °C}$ [Ω]	> 4000
U_n [VDC]	2.5 < U < 30

11.3 Torques of coupling bolts - pos 914.01

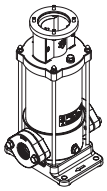
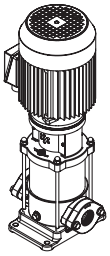
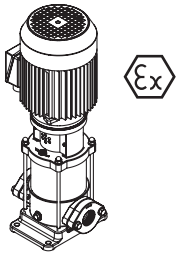
Material	Dimensions	Torques [Nm]
Steel	M6	16
Steel / Cast iron	M8	30
Aluminium	M8	22
Cast iron	M10	70

11.4 CE declaration of conformity

factory declaration (2.1) according to EN 10204
Undersigned:
DP-Pumps
Kalkovenweg 13
2401 LJ Alphen aan den Rijn, The Netherlands
Tel: (+31)(0)-172-48 83 25
Fax: (+31)(0)-172-46 89 30

Declares as manufacturer entirely on his own responsibility, that the products:

Vertical multi-stage centrifugal pumps
Type: DPVE, DPV(S), DPVCF, DPLHS

without motor	**with motor**	**with explosion proof motor**
		
(declaration IIB)	**(declaration IIA)**	**(declaration IIA)**

to which this declaration refers, is in accordance with the following standard:

EN 809	**EN 809**	**EN 809** **EN 13463-1 and EN 13463-5**

according to the provisions of the harmonized norm for pumps and which implies the regulations of machine, EMC and low voltage and (when applicable) ATEX.

Machine directive 98/37/EC	**Machine directive 98/37/EC** **EMC directive 89/336/EEC** **Low voltage directive 73/23/EEC**	**Machine directive 98/37/EC** **EMC directive 89/336/EEC** **Low voltage directive 73/23/EEC** **ATEX directive 94/9/EC**

If the pump is used as a stand-alone product, it is subject to this declaration of conformity.

If the pump is built in an appliance or is assembled together with other equipment in certain installations, then it should not be put into operation until a declaration has been given with respect to the installation or appliance concerned that it complies with the directives listed above.

Alphen aan den Rijn
18-05-2005

Responsible person:
W. Ouwehand, technical director

dp pumps

dp pumps
P.O. Box 28
2400 AA Alphen aan den Rijn
The Netherlands

t +31 172 48 83 25
f +31 172 46 89 30

dp@dp-pumps.com
www.dp-pumps.com

04/2009

BE00000233